

DOMINION OF CANADA
DEPARTMENT OF NATIONAL DEFENCE

Report on Civil Aviation

AND

CIVIL GOVERNMENT AIR OPERATIONS

FOR THE YEAR

1928



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1929

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GATINEAU RIVER, PAUGAN FALLS POWER DEVELOPMENTS.

REPORT ON CIVIL AVIATION

CHAPTER I

INTRODUCTION

The first decade of the post-war flying in Canada closed with the end of 1928. The year has been remarkable in many ways. All phases of aviation have increased greatly and three new and important developments have taken place—First, the inauguration of air mail services.

For some years, companies operating air services to the mining districts have been given permission by the Post Office Department to carry mail and to sell special air mail stickers. In 1928 the Post Office Department decided that the time had come when they could, with advantage, let contracts for the carriage of mails by air.

Such contracts served two useful purposes—the first, the carriage of mails to remote and inaccessible districts to which the service on the ground is slow, costly and inefficient. Such communities as the Magdalen Islands, Anticosti, the settlements along the north shore of the Gulf of St. Lawrence, mining camps in northern Quebec, Ontario and Manitoba, the Yukon and Mackenzie valleys are typical of this class. Mails are now delivered with speed and promptness, at a cost not differing greatly from the old methods of transport.

In the second class are services connecting the main cities of the Dominion and also connecting with the United States air mail services. In it fall such services as the Montreal-Toronto, Montreal-Albany, Montreal-Rimouski (for hastening overseas mail), and the experimental services run during last winter from Winnipeg to Regina and thence to Calgary, with a branch connecting Saskatoon and Edmonton, and the Ottawa-Montreal-Saint John and Halifax service.

During the year very widespread air mail services were inaugurated, serving northern, southern, eastern and western parts of the Dominion. These scattered services will gradually be linked up until a complete chain of air services extends throughout the Dominion.

The second development is the flying club movement. With a view to encouraging the wider use and knowledge of aviation, the Department of National Defence was given the authority to assist in the establishment of flying clubs in the principal cities in the Dominion. Sixteen clubs were formed during the year, of whom fifteen carried out actual flying operations on a very considerable scale. In each of these centres the movement has resulted in greatly increased interest in aviation, in the establishment of a good aerodrome and the preliminary training of many young pilots. All the clubs have received very gratifying support from the communities in which they have been formed, and their success is of distinct value to aviation.

The third new departure was the construction of the mooring mast and base at St. Hubert. This project had its origin in the Imperial Conference in the fall of 1926, when the Prime Minister pledged the support of Canada in the endeavour to establish trans-oceanic services by airship, linking the different dominions of the British Commonwealth. In 1927, a suitable site was purchased at St. Hubert, seven miles south of Montreal, and in 1928 the tower was actually built and the machinery installed. The whole structure will be completed and ready for use early in the spring of 1929 and it is expected that airship flights to the tower from Cardington, the airship station in Great Britain, will take place during 1929.

As has been said, apart from these new developments there has been a general forward movement in aviation. This is not confined to any particular phase and has the support of well informed public opinion throughout the Dominion. The missionary work of the pioneers is beginning to take effect and the Canadian people realize to-day that aviation has played a very useful part in the development and conservation of the natural resources of the country during the past ten years, is continuing this useful work on an ever-extending scale, and that in no country in the world is there a wider and more varied field for the useful application of flying.

The record of Canadian pilots operating in the northern parts of the Dominion, transporting men and supplies to the newly discovered mining camps and carrying prospecting parties into the most inaccessible districts, is a truly remarkable one. The north country has been so organized for flying during the past year that it is not too much to say that no district in continental Canada is now beyond one, or at the most, two days' flying from the end of steel. This shrinking of the Dominion cannot but have an influence in its development.

Some very remarkable flying records have been set up by a number of commercial pilots during the year which, if they had been made in the full glare of publicity which accompanies such flights in most parts of the world, would have made them famous. In northern Canada the work is done, not for its publicity value, but because it is urgently required in the development of the country and for a really useful purpose. It seems to pass unrecognized. Its value to the state and to those interests which have organized it is none the less great.

While all round progress has been very satisfactory, yet there is one phase which is the cause of much concern, that is, the rise in the number of flying accidents. Hitherto, Canada's record in this respect has been remarkable, when it is considered that much of the work was undertaken with obsolescent equipment, from unorganized bases, where the normal facilities accompanying flying services are chiefly conspicuous by their absence, where flights are undertaken daily to unknown and unmapped territory and often under severe weather conditions.

In 1928, however, it is regrettable that there has been an undue increase in the number of accidents causing death and injury. It is still more disquieting that this increase is not in the northern flying, where one might expect it, but in the flying in the settled districts, where facilities are improving. It cannot be traced to any one particular cause and only in one instance has an accident been found to be directly attributed to failure in the aircraft itself. The underlying reason is probably the rapid expansion of the flying services, lowering the average efficiency of the flying and maintenance staff. Really experienced pilots are scarce to-day and operating companies have had to bring on a new generation. These, naturally, lack the experience of the war time pilots, who have many years of training behind them. This explanation is supported by the fact that northern work has been free from accident. This can only be done by really experienced men, and hence, in spite of its danger and difficulty, it has a clean record. The situation is disturbing and calls for the most careful attention on the part of all aircraft operators, so that the reproach may be removed without delay.

CHAPTER 2

ORGANIZATION

The Aeronautics Act, providing for the administration of aeronautics in Canada, became law on the 6th of June, 1919, and by Order in Council (P.C. 1295) dated June 23 of that year, a board was appointed to undertake the preliminary work of organization. This board consisted of representatives of the Departments of Militia, Naval Service, Post Office, and Customs.

Consideration showed that the work fell naturally into three divisions: first, military aviation, having to do with all defence questions; second, civil government operations, that is, the flying carried out for any other department of the Government; and third, the regulation of civil flying. Branches were formed for these three purposes and common technical, accounting, intelligence and clerical services were formed to serve all three.

The preliminary work of organization having been completed, the original board resigned and a new board consisting of the heads of the three main services, a representative of the Department of the Naval Service and the Surveyor General of Canada, was appointed under the chairmanship of the Minister of Militia, on April 19, 1920, by Order in Council (P.C. 826).

This board continued to function until the coming into effect of the National Defence Act on January 1, 1923. By this Act a new department was formed under the Minister of National Defence to administer the military, naval and air services of Canada. In the new department, all air services were grouped in one directorate in the Chief of Staff's Branch. The Civil Government Operations Branch was absorbed by the military service—the Royal Canadian Air Force—and the control of civil aviation was administered by the Secretary Royal Canadian Air Force.

This form of organization continued till July 1, 1927, when, with the increasing importance and growth of both civil aviation and civil government operations and their gradual divergence from the purely military duties of the Air Force, a redistribution of duties became essential. The three main branches were again reformed under the Minister of National Defence. The R.C.A.F. continued as in the past a directorate under the Chief of the General Staff, the Civil Government Air Operations were separated from the Air Force and a directorate, reporting to the deputy minister, was formed for their execution. The control of civil aviation and the organization of airways were grouped in a third branch under the deputy minister and an independent technical service was formed, under the deputy minister, to serve all three.

Each of these branches has clearly defined duties and responsibilities. Co-operation between them should be close and is essential to the wellbeing of each. For instance, the Air Force must look to the civil flying services of the Dominion as the first line of reserve in time of emergency. Their efficient development is therefore of direct interest to the air defence force. It in turn can provide training courses in time of peace in flying, navigation, photography and technical work, which may increase the efficiency of the civil services greatly. Advances in one service in the design of aircraft, engines and accessories may be of the greatest use to the others. Co-operation in all matters in the development of aviation is therefore desirable from every point of view.

The following quotation from the Air Force General Order, dated July 9, 1927, issued under the authority of the Minister of National Defence, shows the division of duties:—

ORGANIZATION OF AIR SERVICES

In order to carry out the intention of the Government to place all civil government flying operations and the control and supervision of civil aviation under civil control and administration, the honourable the minister has authorized the following administrative and organization changes, effective July 1, 1927.

A. ADMINISTRATION

(I) *Headquarters, R.C.A.F.*

To administer and control all military air operations and to administer and control such units, formations, detachments, etc., of the R.C.A.F., as may be placed under such headquarters. These headquarters are to be in charge of the Director R.C.A.F., who is responsible to the Chief of the General Staff.

(II) *Directorate of Civil Government Air Operations.*

To administer and control all air operations carried out by state aircraft, other than those of a military nature, and to administer and control such units, formations, detachments, etc., of the R.C.A.F., as may be placed thereunder by instructions of the honourable the minister. This directorate is to be in the charge of the Director of Civil Government Air Operations who is responsible to the deputy minister.

(III) *Aeronautical Engineering Division.*

To act in a consultant capacity respecting all technical and engineering matters pertaining to the air services, and the carrying out of duties prescribed by the Air Board Act and Regulations thereunder. This division is to be in the charge of the Chief Aeronautical Engineer who is responsible to the deputy minister.

(IV) *Controller of Civil Aviation.*

To administer the Air Regulations, 1920, and to perform such further duties as may be directed by the honourable the minister. The Controller of Civil Aviation is responsible to the deputy minister.

Vacancies and new appointments occurring in the Civil Aviation Branch are now filled by civilians.

The changes in administration necessitated a change in the organization of the Interdepartmental Committee on Civil Government Air Operations, authorized by Order in Council P.C. 677 dated May 3, 1926. The committee was organized under the chairmanship of the deputy minister, having as its members the Surveyor General, the Director of the Dominion Forest Service and the Chief Aerial Surveys Engineer, all of the Department of Interior; the Director of Civil Government Air Operations, the Controller of Civil Aviation and the Chief Aeronautical Engineer. This committee has continued to function and provides a platform for the discussion of all matters pertaining to air operations for the Forest and Survey Services.

Activity in regard to air mail services necessitated the formation of an Interdepartmental Committee with officers from the Postal and Air Services. This was accordingly formed and is functioning satisfactorily.

A third Interdepartmental Committee on which the Air Service was represented was formed to deal with the investigation of the ice conditions in Hudson strait and consisted of representatives of the Departments of Marine and Fisheries, Railways and Canals, and the Air Service.

CHAPTER 3

CIVIL AVIATION BRANCH

The Controller of Civil Aviation is responsible to the Deputy Minister of National Defence for the administration of the Air Regulations, and the control of commercial and private flying in Canada; the location and equipment of airways, the construction of airship bases and the oversight of Flying Clubs. The Branch has three divisions, Air Regulations, Airways, and Information.

AIR REGULATIONS

Provision is made for the control of civil aviation in Canada by the Aeronautics Act, 1919, and in accordance with its terms, an Order in Council was passed on December 31, 1919, approving and promulgating the Air Regulations, 1920, which cover in detail the air law of Canada and provide a complete set of rules which have proved in practice to be fundamentally sound. These regulations conform in essentials to the International Convention, and the standards laid down in it are their basis.

The Air Regulations were amended by an Order in Council dated August 16, 1928, as follows:—

“114. (4) If the Minister of National Defence has reason to believe, on complaint or otherwise, that a private aircraft within Canada is intended or is about to proceed on any flight while in a condition unfit for flight, he may give such directions and take such steps by way of provisional detention of the aircraft or otherwise in relation thereto as may be necessary for the purpose of causing the aircraft to be inspected by authorized representatives of the Minister of National Defence, and may, as the result of such inspection, cause the aircraft to be detained until he is satisfied that such alterations or repairs as he may consider necessary to render the aircraft fit for flight have been made. No aircraft which has been so detained shall fly until authorized so to do by the Minister of National Defence or his authorized representatives.”

The division is in charge of the Superintendent, Air Regulations. During 1928, two inspectors were employed, with headquarters at Ottawa. Provision is being made for a Resident Inspector for western Canada, and as conditions warrant, the staff of Inspectors will be increased, and the country formed into districts.

Its duties are the registration and licensing of aircraft and their certification for airworthiness; the examination and licensing of pilots, navigators and air engineers; prevention of dangerous flying; inquiries into the causes of air accidents; International flying, including the import and export of goods by air, and immigration and emigration of persons by air.

All aircraft are inspected at least once a year and after every major overhaul, by an inspector of this division. Every commercial aircraft must, in addition, be inspected daily by a licensed air engineer to ensure that it is maintained in an airworthy condition. When technical advice is required, the Chief Aeronautical Engineer is consulted. Commercial pilots are required to pass written examinations on the functions, construction and maintenance of aircraft, their engines and accessories. A commercial pilot's certificate is granted, subject to the holder passing a medical examination at least every six months, to ensure that the required physical standard is maintained. They must also have a full knowledge of Air Regulations, and the International Convention for Air Navigation, and in addition, a knowledge of map reading, orientation,

location of position, and elementary meteorology. A minimum of 50 hours solo flying is insisted upon before any applicant is granted a commercial pilot's license.

Air engineers are required to qualify for their licenses by taking written or oral examinations and practical tests on the construction, maintenance and operation of aircraft and aero engines. They must produce credentials that they have given two years' satisfactory service in the construction or operation of aircraft. A pilot may qualify as an air engineer, providing he has the practical and theoretical knowledge necessary to maintain his aircraft in proper airworthy condition.

During 1928, 197 aircraft were inspected and given airworthiness certificates; 177 applicants were examined and granted commercial pilots' licenses; 139 applicants were examined and granted private pilots' licenses; and 88 applicants were examined and granted air engineers' licenses.

A statistical summary of the accidents occurring in civil aviation will be found on page 15.

Eighteen accidents occurred during 1928, involving the death of six pilots, eleven passengers, and the serious injury of two pilots and five passengers, slight injury to six pilots and six passengers, and slight injuries to three third parties.

Two disasters involved the death of two pilots and seven passengers, and injuries to five passengers. One was caused by the aircraft stalling on a turn for reasons unknown, and control was not recovered in time to prevent a crash. The pilot and one passenger were killed; four passengers seriously, and one slightly injured. The other aircraft flew into the sea off the Pacific Coast, under conditions of low visibility. The pilot and six passengers were killed.

Of the other accidents, involving the death of four pilots and four passengers, one was due to engine failure; one due to the failure of the aircraft to respond to controls in a spin; and four were due to the pilots' making evolutions near the ground. One was due to an error of judgment and carelessness of the pilot in attempting to clean his windshield while flying low over glassy water in foggy weather. One pupil fell from an aircraft while taking dual instruction.

One accident was found to be due to a defect in the design of the empennage of an aeroplane.

AIRWAYS

This division is in charge of the Superintendent, Airways. During 1928, his staff consisted of one Inspector at Ottawa. Provision is being made for additional Inspectors as required. The personnel at St. Hubert Airport are under his supervision. Its duties include,—

- (a) The inspection, licensing, and registration of airports. Aircraft operators are required to license their regular operating bases or carry out their operations from a licensed airport.

The suitability of airport sites is carefully studied and examined before licenses are issued. The features given special attention are locality, surface conditions, obstacles, and in the case of seaplane bases, exposure to heavy seas.

- (b) The supervision, development and maintenance of Government airports at St. Hubert and Rimouski. Both these airports were established during 1928 and provision has been made for further development at St. Hubert.
- (c) The investigation and development of air mail routes, including communications for the collection and dissemination of meteorological reports.

During 1928, regular air mails were established between Rimouski-Montreal and Ottawa, and Montreal-Toronto. Investigation was undertaken of routes in the Maritime Provinces, western Ontario and northern Ontario, west to Winnipeg. Provision has been made for more complete surveys to be made over the above-mentioned routes.

During the year, thirty-seven airport sites were inspected and nineteen licenses issued. In addition, numerous municipalities and commercial operators have been given advice as to the suitability of proposed airports.

INFORMATION

The duties of this division comprise the preparation of the Annual Report on Civil Aviation, compilation and revision of reports on aviation for Government and other publications, the collection and dissemination of information, records and statistics of commercial operators, light aeroplane clubs and accidents, etc. A liaison is maintained with other Governments of the Empire and a news letter on civil aviation, compiled and distributed each quarter.

REPORT ON THE DEVELOPMENT OF AERODROMES IN CANADA FOR THE YEAR 1928

Province	*Incorporated cities and towns—population near (1,000) and over			Licensed		Number cities or towns served	Aero-drome sites inspected 1928	Activity Municipal interest shown by enquiry 1927-1928	*Provincial population estimated 1928
	Cities	Towns	Total	Airports, aerodromes	Seaplane port or anchorage				
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Alberta.....	6	54	60	4	.....	3	1	4	631,900
British Columbia.....	2	34	36	2	.....	2	5	4	583,000
Manitoba.....	4	30	34	4	.....	2	1	2	655,000
New Brunswick.....	3	22	25	1	1	2	1	.....	415,000
Nova Scotia.....	2	43	45	1	1	2	7	1	547,000
Ontario.....	26	145	171	12	13	23	11	10	3,229,000
Prince Edward Island.....	1	9	10	.....	.....	.....	.....	.....	86,400
Quebec.....	21	64	85	3	8	7	6	8	2,647,000
Saskatchewan.....	8	79	87	6	.....	4	5	4	851,000
Yukon Territory.....	1	3	4	.....	.....	.....	.....	.....	3,500
Northwest Territories.....	.....	.....	.....	.....	.....	.....	.....	.....	9,200
Totals.....	74	483	557	33	23	45	37	33	9,658,000

(1) The difference in totals of columns (e) plus (f) and of column (g) is due to some cities having more than one aerodrome.

(2) Figures in column (i) are based upon legitimate enquiries, usually civic officials.

*Abstract Canadian Almanac 1929.

INTERNATIONAL CONFERENCE ON CIVIL AERONAUTICS, WASHINGTON, D.C.

To mark the twenty-fifth anniversary of the first flight on a heavier-than-air flying machine by the Wright Brothers in December, 1903, the President of the United States issued invitations for an International Conference on Air Navigation. Delegates from all over the world attended in large numbers. After visits to the International Aircraft Show in Chicago, a number of the leading aircraft and engine factories and airports in the United States, the conference convened in plenary session at Washington on December 12, 1928.

The proceedings were opened by President Coolidge in person. Many interesting papers on all phases of civil aviation, aircraft and engine manufacture, meteorology, wireless, provision of airways, control of air traffic and other kindred subjects were presented by leading aeronautical authorities from many countries.

The Canadian delegates were as follows:—

Official

Mr. G. J. Desbarats, Deputy Minister of National Defence.

Mr. W. W. Cory, Deputy Minister of the Interior.

Mr. P. T. Coolican, Assistant Deputy Postmaster General.

Group Captain J. L. Gordon, D.F.C., A.D.C., Director of Civil Government Air Operations.

Wing Commander E. W. Stedman, O.B.E., representing Royal Aeronautical Society of Great Britain.

Mr. J. A. Wilson, Controller of Civil Aviation.

Mr. F. H. Peters, Surveyor General.

Mr. J. D. Craig, Director General of Surveys and Boundary Commission.

Unofficial

Mr. F. H. Clergue, President of Universal Engineering Corporation.

Mr. J. O. Apps, General Executive Assistant, Canadian Pacific Railway.

Mr. R. A. Loader, General Manager of DeHavilland Aircraft of Canada at Toronto.

Mr. A. E. Low, President, Canadian Colonial Airways.

Mr. W. T. Reid, Curtis-Reid Aircraft Co.

Capt. W. R. Maxwell, Director of Provincial Air Service for Ontario.

Mr. T. T. Bower, Postmaster, Winnipeg.

Mr. Reginald E. Nicoll.

A paper was presented by the Deputy Minister of Interior on the use of aircraft by his department, and at the first plenary session the Controller of Civil Aviation read a paper on the development of civil aviation in Canada. At the second plenary session on December 13, the Deputy Minister of National Defence presented the following statement on certificates of airworthiness:—

I have to thank you for this opportunity of presenting to this conference a short statement regarding a condition which has arisen in Canada and which, no doubt, also exists in other countries.

The International Convention for Air Navigation outlined at the end of the war an agreement amongst allied countries under which one country would recognize the airworthiness of aircraft originating in other countries. This excellent and necessary agreement gave a basis which made international air navigation workable.

The United States have not ratified this agreement and have formed their own basis for airworthiness requirements. Canada, while being a signatory state of the International Convention, has a working agreement with the United States by which the certificates of one country are recognized by the other.

With the increase in aviation now experienced in all countries, it is very desirable that a much closer agreement should be reached by all countries interested in aviation. This is particularly noticeable in a country situated as is Canada, where, although the factories in the country produce a small number of aircraft, the operating requirements at the present time necessitate the importation of considerable numbers of aircraft and aircraft parts from different countries.

Canada imports aircraft from Great Britain, the United States, France, Germany and these craft carry airworthiness certificates issued by the countries of origin. These certificates are based on different requirements, and as a result, some confusion has arisen.

It is very desirable, therefore, that these imported aircraft parts should be built up to the same standards as the aircraft actually manufactured in the country.

I suggest to the members of the conference that on their return home, they urge on their respective governments the advantage and necessity of unifying the standards of the certificates of airworthiness issued by the different countries, so that aircraft exported for use abroad could be accepted by the importing country with the assurance that they were built to common standards and to a uniform basis of technical quality.

International trade in aircraft cannot flow smoothly until an agreement is reached on the standards to which aircraft for export are built. No more important question was brought before the conference and the action of the Canadian Government in bringing up the matter through the head of its delegation may help to bring about a solution of this difficult matter.

AWARD OF THE TRANS-CANADA TROPHY

In September, 1926, Mr. J. Dalzell McKee, accompanied by Squadron Leader A. E. Godfrey, M.C., A.F.C., R.C.A.F., made the first trans-Canada flight on a "Douglas" seaplane.

To commemorate this, and to show his appreciation of the assistance rendered to him in this flight by the Royal Canadian Air Force and many civil aviation organizations in Canada, a trophy was presented by Mr. McKee, to be awarded annually to the person giving most meritorious service during the year in the advancement of aviation in Canada.

The trophy is about three feet high and takes the form of a winged figure flying over the world, holding aloft a seaplane. The whole, which is silver, rests on a marble base, on the front of which is a silver shield, bearing the inscription "Trans-Canada Trophy." On the reverse face there is another shield, with the following inscription—"Presented by J. Dalzell McKee, Esq., to commemorate the first Trans-Canada Seaplane Flight, September, 1926, to be awarded annually for meritorious service in the advancement of aviation in Canada."

Smaller shields on which will be engraved the names of the winners are also provided.

A generous endowment to provide a replica for each winner was also given by Mr. McKee.

He was killed in a flying accident in 1927, and his intentions as to the award of the trophy are being carried out in the spirit in which he gave it. A Committee was appointed to deal with the award. Their recommendations are based on the following considerations:—

1. The recipient should be one who is domiciled in Canada and who is identified with Canadian flying, either military or civil.
2. Qualifications as a pilot is a prior claim to consideration, but lack of such qualification does not exclude from consideration the claims of others connected with aviation who perform meritorious service.
3. Continuous performance throughout the year should receive greater consideration than a single brilliant exploit.
4. Operations tending to advance the cause of aviation should receive consideration over exploits of a difficult or dangerous character, serving no useful end.
5. The extension of the operation of aircraft into new fields should receive special consideration.

All organizations operating aircraft in Canada and all units of the Royal Canadian Air Force are requested to make recommendations regarding their personnel and, in addition, the committee considers the claims of other individuals.

Colonel the Hon. J. L. Ralston, Minister of National Defence, trustee for the trophy under the deed of gift, has approved the following awards:—

1927—Captain H. A. Oaks, D.F.C., Western Canada Airways.

1928—Captain C. H. Dickins, D.F.C., Western Canada Airways.

Both these officers have played an important part in the organization of flying services in northern and western Canada. They have brilliant records of flying under arduous conditions at all seasons of the year.

STATISTICAL SUMMARY OF CIVIL AVIATION IN CANADA 1928, INCLUDING
ONTARIO PROVINCIAL AIR SERVICE AND LIGHT AEROPLANE CLUBS

Nature of Information	1926	1927	1928
<i>General Analysis</i>			
Firms manufacturing aircraft.....	2	2	4
Firms chiefly operating aircraft.....	14	20	53
Firms using aircraft as auxiliary service.....	2	1	1
Aircraft flights made.....	4,755	16,748	75,285
Aircraft hours flown.....	5,860	12,070	43,071
Approximate aeroplane mileage.....	30,290	209,583	1,557,917
Approximate float seaplane mileage.....	356,481	247,238	797,998
Approximate boat seaplane mileage.....	.....	372,189	352,158
Approximate amphibian mileage.....	6,332	.....	20,341
Total aircraft mileage.....	393,103	820,010	2,728,414
Average flight duration (hours-minutes).....	1-14	0-43	0-32
Number of pilots carried.....	4,755	16,748	75,285
Number of passengers carried.....	6,436	18,932	74,669
Total personnel carried.....	11,191	35,680	149,954
Pilots carried one mile (pilot miles).....	393,103	820,010	2,728,414
Passengers carried one mile (passenger miles).....	631,715	1,424,031	2,883,782
Total personnel carried one mile (personnel miles).....	1,024,818	2,253,041	5,612,196
Total freight or express carried (lbs.).....	724,721	1,098,348	2,404,682
Total mail carried (lbs.).....	3,960	14,684	316,631
<i>Licensed Civil Airharbours</i>			
Aerodromes (public).....	4	7	20
Aerodromes (private-commercial).....	10	10	12
Also licensed for Customs.....	3	5	7
Seaplane stations (public).....	3	4	5
Seaplane stations (private-commercial).....	16	15	7
Also licensed for Customs.....	2	2	2
Aerodrome-seaplane stations (public).....	.....	.....	.....
Aerodrome-seaplane stations (private-commercial).....	.....	.....	.....
Also licensed for Customs.....	.....	.....	.....
Airship harbours.....	.....	.....	.....
Also licensed for Customs.....	.....	.....	.....
Total airharbours (all types).....	34	36	44
<i>*Licensed Civil Aircraft</i>			
Aeroplanes (single-engined).....	15	36	136
Aeroplanes (twin-engined).....	.....	.....	.....
Aeroplanes (triple-engined).....	.....	.....	3
Float seaplanes (single-engined).....	.....	17	120
Float seaplanes (twin-engined).....	.....	.....	.....
Boat seaplanes (single-engined).....	28	21	33
Boat seaplanes (twin-engined).....	.....	.....	.....
Amphibians (single-engined).....	1	.....	4
Amphibians (twin-engined).....	.....	.....	.....
Airships.....	.....	.....	.....
Balloons.....	.....	.....	.....
Total aircraft (all types).....	44	67	264
<i>Licensed Civil Air Personnel</i>			
Pilots only (flying machines).....	20	43	258
Pilot-Air Engineers.....	18	29	70
Pilot-Air Navigators.....	.....	.....	.....
Pilot-Air Engineer-Air Navigators.....	.....	.....	.....
Air Engineers only (flying machines).....	65	74	130
Air Engineer-Air Navigators.....	.....	.....	.....
Air Navigators only (flying machines).....	.....	.....	.....
Airship Officer Pilots (1st Class).....	.....	.....	.....
Balloon Pilots.....	.....	.....	.....
Total licensed personnel.....	103	148	458
Unlicensed Air Mechanics employed.....	43	59	85

*These figures show duplication, since in several instances the aircraft are used both as landplanes and seaplanes.

STATISTICAL SUMMARY OF CIVIL AVIATION ACCIDENTS FOR THE YEAR 1928

Nature of Information	1926	1927	1928
<i>Analysis of Flying Accidents</i>			
Accidents resulting in death to one or more occupants of aircraft...	2	3	10
Accidents resulting only in injury to occupants of aircraft.....	3	1	8
Total flying accidents causing death or injury.....	3	4	18
Accidents (included above) resulting in death to third party.....			
Accidents (included above) resulting only in injury to third party.....			3
Accidents (included above) not involving injury to third party.....	5	4	15
Accidents (included above) resulting in death to occupants or third party.....	2	3	10
Accidents (included above) resulting in injury to occupants or third party.....	3	1	8
<i>Casualties to Personnel</i>			
Pilots killed.....	1	2	6
Pilots injured.....	2	1	8
Passengers killed.....	1	2	11
Passengers injured.....	6	2	11
Third party killed.....			
Third party injured.....			3
Total personnel killed.....	2	4	17
Total personnel injured.....	8	3	22
<i>Accidents and Casualty Rates</i>			
Number of aircraft-miles per accident.....	78,621	207,252.5	151,579
Number of aircraft-flights per accident.....	951	4,157	4,182.5
Number of aircraft-hours per accident.....	1,172	3,017.5	2,392.8
Pilots killed per 1,000 miles flown by pilots.....	.0025	.0024	.0022
Pilots injured per 1,000 miles flown by pilots.....	.0051	.0012	.0029
Passengers killed per 1,000 passenger-miles.....	.0016	.0014	.0038
Passengers injured per 1,000 passenger-miles.....	.0098	.0014	.0038
Passengers killed per 1,000 passengers carried.....	.1554	.0922	.1467
Passengers injured per 1,000 passengers carried.....	.9323	.0922	.1467
Third party killed per 1,000 aircraft-miles.....			
Third party injured per 1,000 aircraft-miles.....			.0011

STATISTICAL SUMMARY OF CIVIL AVIATION (BY PROVINCES) FOR THE YEAR 1928
INCLUDING OPERATIONS BY THE ONTARIO PROVINCIAL GOVERNMENT AND LIGHT AEROPLANE CLUBS

Province	Light Aeroplane Clubs	Number of firms (Location of headquarters)	Nature of operations and number of firms engaged in each										Flying instruction	Aircraft flights	Aircraft hours	Average flight duration (Hrs. Mins.)	Approximate aeroplane mileage.	Approximate float seaplane mileage	Approximate boat seaplane mileage	Approximate amphibian mileage	Total aircraft mileage	Number of square miles of vertical photography	Number of square miles of oblique photography
			Passenger carrying	Exhibition flying	Air reconnaissance and exploration	Freight & express carrying	Aerial photogra- phy generally	Air photographic surveying	Forest reconnais- sance and fire protection	Mail carrying	Advertising												
Northwest Territories.....		1		1	1								167	228	1-21		28,355			28,355			
Yukon Territories.....	2	2			2					2			765	335	0-26	16,094	1,030			17,124			
British Columbia.....	2	2	2		3	2	2	2	2			2	2,683	1,610	0-37	16,994	13,915	38,359		69,268	25		
Alberta.....	2	3	4	1	2	3	2	2		1	2	2	5,220	1,790	0-20	117,420	1,450			118,870		900	
Saskatchewan.....	3	3	7	2	2	1				1		2	7,873	2,983	0-23	231,642	6,400			238,042			
Manitoba.....	1	5	5	3	1	2				1	1	3	15,094	6,359	0-25	224,404	190,676		2,320	417,400			
Ontario.....	5	29	21	8	3	8	4	2	1	5	8	10	32,027	20,898	0-39	589,377	457,660	236,892	1,692	1,285,621	2,743	4,657	
Quebec.....	2	9	8	1	3	6	4	4	1	5	1	5	10,888	8,597	0-47	346,461	98,512	76,907	11,529	533,409	12,223	3,274	
New Brunswick.....										1			64	64	1-00				4,830	4,830			
Nova Scotia.....	1												504	207	0-24	15,525				15,525			
Prince Edward Island.....																							
Totals.....	16	53	50	15	15	25	12	10	4	16	12	24	75,285	43,071	0-43	1,557,917	797,998	352,158	20,341	2,728,414	14,991	8,831	

These figures naturally show considerable duplication in the actual number of firms operating, since in several instances the same firm is represented at the same time under different kinds of operations and engaged in different provinces.

CHAPTER 4

COMMERCIAL FLYING

1928 has seen a notable increase in the number and quality of commercial aircraft. The result has been a great increase in flying time. This is particularly noticeable in Western and Northern Canada. One company with headquarters in Winnipeg did more flying than was done in the whole Dominion during 1927. All commercial flying has been self-sustaining and no subsidies have been granted by the Government.

Air mail contracts have been let to commercial companies by the Post Office, and contracts for forestry protection, fire detection patrols, air photography, and transportation, let to commercial companies by the Dominion and Provincial Governments. Apart from these contracts, the chief field for flying has been in the transportation of men and supplies to the northern mining camps. Flying is continued in winter to an ever-increasing extent. The handicaps of winter flying have been largely overcome by the use of aircooled engines, cabin machines, and efficient ski undercarriages. Nine schools of flying were conducted with an increasing number of pupils.

Statistics of these operations will be found on page 14 to 17, and include aircraft operating companies, the Ontario Provincial Air Service, and light aeroplane clubs, in fact, all flying done in Canada except that by the Air Services of the Department of National Defence, and privately owned aircraft. There are now 42 such organizations, 264 aircraft are licensed, and 250 commercial pilots and 200 air engineers hold certificates.

The number of flights made in 1928 has increased more than 350 per cent over 1927, the figures being: 1927—16,748, and 1928—75,285. The hours flown have risen from 12,070 to 43,071, an increase of over 250 per cent. The increase in passengers carried is particularly encouraging, showing a greater public confidence in air travel. The figures are 1927—18,932 passengers; 1928—74,669 passengers; 1927—passenger miles 1,424,031; 1928—2,883,782 passenger miles. In the same way, freight traffic has increased from 1,098,346 pounds in 1927, to 2,404,682 pounds in 1928. Mail carried: 1927—14,684 pounds; 1928—316,631 pounds.

CANADIAN AIRWAYS LIMITED

This company maintains the daily air mail service between Montreal and Toronto, under contract with the Post Office Department. They are also engaged in forest protection patrols and air photography in Quebec. Their main base and repair shops are situated at Point au Trembles.

Fifteen hundred square miles were photographed under contract with the Department of Lands and Forests, Quebec, in the Lake St. John district (Chibougamau). They also photographed 600 square miles of the Laurentide Park, situated between Bay St. Paul and Chicoutimi, on the north shore of the river St. Lawrence, under contract with the Department of Lands and Forests, Quebec, see also page 44.

Caches were established and over 25,000 pounds of provisions carried into Chibougamau and River Peribonka, in a period of 30 days. They operated Passenger Services at Muskoka Lakes, Toronto, and Montreal, flights being made from Toronto to Lac Seul, Montreal to Lac Seul, and Montreal to Seven Islands.

STATISTICAL SUMMARY OF CIVIL AVIATION (BY PROVINCES) FOR THE YEAR 1928
INCLUDING OPERATIONS BY THE ONTARIO PROVINCIAL GOVERNMENT, AND LIGHT AEROPLANE CLUBS

Province	Passen- gers carried	Analysis of Transportation						Licensed Air Harbours				*Licensed Aircraft				†Licensed Personnel				Personnel Employed					
		Pilots carried one mile	Passengers carried one mile	Total personnel carried one mile	Mail carried	Freight or express carried	Total freight, express or mail carried	Public	Private Commercial Licensed also for Customs	Total air-harbours	Aeroplanes	Float Seaplanes	Boat Seaplanes	Amphibians	Total Aircraft	Pilots only	Pilot Air-Engineers	Pilot Air-Engineers Air Navigators	Air Engineers only	Airship Officer Pilots	Total licensed personnel	Pilots actually employed	Air Engineers actually employed as such	Unlicensed mechanics actually employed	
		(Pilot miles)	(Passen- ger miles)	(Personnel miles)	(Pounds)	(Pounds)	(Pounds)																		
Northwest Territories.....	550	28,355	30,690	59,045	.....	15,775	15,775	..	.....	.....	.....	2	.....	2	2	1	.....	.....	.....	3	3	1	1	
Yukon Territory.....	157	17,124	12,627	29,751	13,902	5,683	19,585	..	.....	.....	3	2	.....	4	4	.....	.....	.....	.....	4	4	4	2	
British Columbia.....	3,749	69,268	61,290	130,558	226	1,800	2,026	1	1	2	1	1	1	3	5	3	.....	2	..	10	7	5	2	
Alberta.....	4,183	118,870	119,040	237,910	1,100	15,050	16,150	3	1	4	9	.....	.....	9	9	3	.....	1	..	13	12	4	3	
Saskatchewan.....	7,473	238,042	249,825	487,867	1,200	13,090	14,290	3	3	2	6	14	.....	14	7	14	.....	2	..	23	11	6	1	
Manitoba.....	13,822	417,400	453,140	870,540	37,439	674,685	712,124	3	1	2	4	20	42	5	50	38	13	.....	35	..	86	25	31	33
Ontario.....	33,259	1,285,621	1,155,369	2,440,990	133,019	1,455,368	1,588,387	8	8	2	16	77	47	13	2	128	127	16	66	..	209	88	62	29
Quebec.....	11,085	533,409	790,026	1,323,435	123,345	223,231	346,576	3	7	2	10	12	25	14	2	53	64	16	.....	24	104	45	24	22
New Brunswick.....	.....	4,800	.....	4,800	6,400	.....	6,400	1	.....	1	1	.....	1	.....	1	3	1	.....	.....	3	.....	.....	.....	.....
Nova Scotia.....	391	15,525	11,775	27,300	.....	.....	.....	1	.....	1	.....	.....	.....	.....	3	.....	1	.....	.....	3	1	1	1	1
Prince Edward Island.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals.....	74,669	2,728,414	2,883,782	5,612,196	316,631	2,404,682	2,721,313	23	21	10	44	136	120	33	4	264	258	71	131	..	458	196	138	94

*These figures show duplication since in several instances aircraft are used both as landplanes and seaplanes.

†Allocation by provinces is governed by home address of individuals.



FLIN FLON MINING PROPERTY

During the year their total flying time was 1,890 hours, of which 1,039 hours were on freight, mail or express carrying, 162 hours on passenger carrying, 26 hours on flying instruction, 246 hours on vertical, and 15 hours on oblique photography, and 401 hours on other operations and service flying, 1,597 passengers; 85,130 pounds of goods; and 28,320 pounds of mail were carried.

During 1928 they operated two Fairchild F.C. 2 Monoplanes, and five H.S. 2. L. flying boats. Seven pilots were employed.

CANADIAN COLONIAL AIRWAYS LIMITED

For the purpose of operating the Montreal-Albany air mail service, this company was formed with headquarters in Montreal. The service was inaugurated on October 1, 1928, carrying the mail southbound, under contract with the Post Office Department, Ottawa, and northbound under similar arrangements with the United States Post Office. In addition to air mail, all ordinary and first-class mail is carried in both directions. A daily service is maintained, including holidays, Sundays excluded. Passengers are carried up to capacity, at rates of \$35 to Albany, and \$50 to New York, and vice versa. From October 1 to December 31, the total flying time was 224 hours; 260 flights were made and 18,065 miles flown; 30,660 pounds of mail, 100 pounds of express, and 493 passengers were carried. They operated four Fairchild Cabin Monoplanes, powered with Pratt and Whitney 420-horsepower engines. Two Pitcairn Super-Mailwings, powered with Wright Whirlwind engines, are used for mail exclusively, in bad weather. Seven pilots were employed.

THE CANADIAN TRANSCONTINENTAL AIRWAYS LIMITED

The activities of this company include the carrying of mail, freight and passengers in Quebec and New Brunswick. A contract was obtained from the Canadian Pacific Railway Express Company to carry express on their mail route. They operate air mail services under contracts with the Post Office Department between Quebec-Seven Islands-Anticosti, and Moncton-Magdalen Islands during the winter months, and the service between Rimouski, Montreal, and Ottawa during the season of navigation in the St. Lawrence river, in connection with the incoming and outgoing transatlantic mails. Their bases are at St. Hubert, Lac Ste. Agnes, P.Q.; Pointe au Pere, P.Q., Quebec city, and at Ste. Felicien to serve the mining centre at Chibougamou. Several trips were made carrying passengers to the lower St. Lawrence, as far as Godbout, on the north shore, and Rimouski and Riviere-du-Loup, on the south shore.

On April 14, two Fairchild Monoplanes were sent to the rescue of the "Bremen", just landed on Greenly Island, some 700 miles from their base at Lake Ste. Agnes. The first, piloted by A. C. Schiller, and carrying as a passenger Doctor Louis Cuisinier, left Lake Ste. Agnes on the 14th, at 10.45 a.m., spent the night at Seven Islands, and on Sunday, April 15, in the afternoon, flying through a heavy snow storm, reached the transatlantic flyers at Greenly, landing on skis on the bay between Greenly Island and Blanc Sablon. The second left base at Ste. Agnes, piloted by Romeo Vachon, carrying as passengers representatives of the Canadian and American press, and moving pictures. On the Wednesday following the second machine returned to the base with Commander Fitzmaurice. On Friday of the same week, the first machine returned to the base with the rest of the Bremen's crew. Between April 14 and 27, twelve aeroplanes, including the Ford Trimotor of Commander Byrd, visited Lake Ste. Agnes. Conditions were such that all planes could land and take off, either on wheels or skis, from the ice in the lake.

During the year their total flying time was 544 hours. Fifty-six thousand and thirty-five miles were flown. One thousand three hundred and twenty passengers, 65,347 pounds of goods, and 94,185 pounds of mail were carried. They operated four Fairchild Cabin Monoplanes, two Loening Amphibians, and one Stearman aircraft. Six pilots were employed.

COMPAGNIE AERIEENNE FRANCO CANADIENNE

This company specializes in air photography, and for some years has carried out air survey contracts for the Department of Lands and Forests, Quebec, in the Gaspé peninsula. Particulars of these will be found on page 44. Their main base is at Pointe-aux-Trembles, and sub-bases are established at Gaspé, Val Brillant, New Richmond, Lac Ste. Anne, Notre Dame du Lac, and Lachine.

They have a complete and modern airport at Pointe-aux-Trembles, Montreal. A reinforced concrete hangar, with 10,000 square feet floor space, has been constructed, which has the largest reinforced concrete roof trusses on the North American continent, the span being 110 feet. A sub-base for passenger services was established at Lachine and was extensively used throughout the season. They enlarged their laboratory at Val Brillant, where all photographs are developed, and erected a studio for draughting work. Arrangements are being made for the establishment of an aerodrome at Quebec in 1929. This will include a photographic laboratory.

Their total flying time was 668 hours, of which 126 hours was on passenger carrying, 12 hours on flying instruction, 265 hours on vertical and 23 hours on oblique photography, with 42 hours on other operations and service flying; 53,440 miles were flown. An area of 7,550 square miles was photographed and 1,751 passengers carried. They operated nine Schreck H.M.T.2 flying boats and employed seven pilots.

CONTINENTAL AERO CORPORATION LIMITED

This company was formed early in 1928, and operations commenced in August. Flying activities were carried out at St. Hubert Airport, Montreal. They conduct a flying training school, a passenger taxi service, and have also done some commercial air photography.

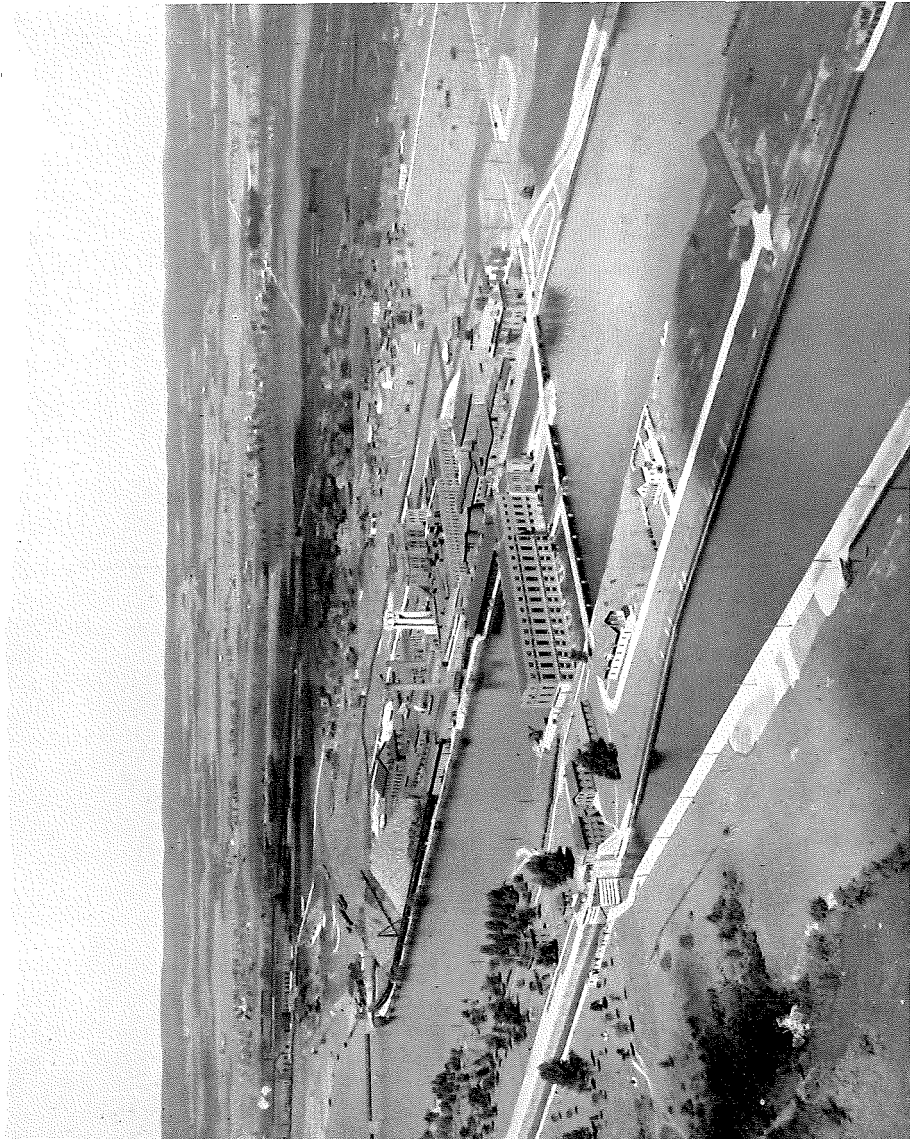
During the year their total flying time was 355 hours. Seven hundred and ninety-eight flights were made and 30,134 miles flown, 217 square miles of oblique photography done, and 27 pupils given flying instruction. Six hundred and twenty-two passengers and 721 pounds of goods were carried. They operated two Travelair and one Monocoupe aircraft, and employed two pilots.

FAIRCHILD AVIATION LIMITED

The chief activities of this company are air photography, the making of inventories by aerial sketching, and transportation. Their main base is at Grand'Mere, P.Q. Forest fire patrols were carried out in the Gatineau valley for the International Paper Company, from a base at Blue Sea Lake. Forest sketching operations were carried out near La Tuque, Weymont, Joybert, Maniwaki, and Lake Kipawa, in Quebec, and at Chappleau and Petawawa in Ontario, under contract with the various lumber, pulp, and paper companies.

Air photographic operations were carried out in the vicinity of Gouin, Drummondville, Montreal, and other parts of Quebec.

This company has shown a steady increase in activities since they began operations in 1923. During 1928 the total hours flown were 1,232, of which 141 hours was on freight and mail carrying, 209 hours on passenger carrying, and 431 hours on forest fire protection and forest sketching, 164 hours on vertical and 31 hours on oblique photography, and 354 hours on other operations and service flying. One thousand and ninety flights were made and 103,530 miles flown.



SPANISH RIVER PULP AND PAPER COMPANY, SAULT STE. MARIE, ONTARIO.

Two thousand one hundred and thirty square miles of vertical, and 3,000 square miles of oblique photography was done, and 5,000 square miles sketched from the air. One thousand five hundred and ninety-nine passengers; 66,078 pounds of goods, and 500 pounds of mail were carried. They operated six Fairchild monoplanes, one Huff Daland float seaplane, one Curtiss M.F. flying boat, and one Aero-marine flying boat. Six pilots were employed.

GENERAL AIRWAYS LIMITED

This company was established in June, and commenced operations from a base at Amos, P.Q., to carry passengers and freight as required to the mining camps in that district. Flights were made to and from Toronto, Montreal, and Ottawa, and to James bay.

During the year 485 flights were made; 287 hours and 25,800 miles were flown; 458 passengers and 5,000 pounds of goods were carried. One Fairchild F.C. 2 and D.H. Moth aircraft were operated. Three pilots were employed.

INTERNATIONAL AIRWAYS LIMITED

This company acquired the business of Elliott Air Services, Hamilton, Ont., on May 1, 1928, and established their headquarters at Hamilton with branches at Toronto and Ottawa, Ont., and at Montreal and Sherbrooke in Quebec. Flying schools are conducted at Hamilton, Toronto, Montreal and Sherbrooke, and an Air Survey Division is maintained at Ottawa. Later they purchased the business of Canadian Airways Limited, Montreal. Photographic contracts have been done for various firms covering 243 square miles of vertical and 7 square miles of oblique photography. They also engaged in exhibition flying. Thirty-five such flights were made and 27 parachute descents.

During the year 7,025 flights were made and 3,412 hours were flown, of which 2,575 hours were on flying instruction; 745 hours were on passenger, freight and mail carrying, 58 hours on exhibition flying, and 33 hours on air photography; 2,277 passengers and 500 pounds of mail were carried; 102 pupils were given flying instruction. The aircraft operated were 5 Curtiss Canucks, 1 Curtiss J.N.4, 8 Swallows, 1 Loening Amphibian, 1 Fairchild F.C.2, 6 D.H. 60X Moths, and 1 Fokker Universal. Twelve pilots were employed.

AIRCRAFT LIMITED

Operations were commenced by this company in August, at Toronto, where they conduct a Flying Training School.

During the year their total flying time was 520 hours; 1,730 flights were made and 39,000 miles flown; 989 passengers were carried and 60 pupils given flying instruction. They operated two D.H. 60X Moth aircraft and employed five pilots.

DOMINION EXPLORERS, LIMITED

The operations of this company were confined to mineral exploration in the Hudson bay district. Two Fairchild Monoplanes were flown from Amityville, Long Island, N.Y., via Montreal, Biskotasing, and Orient Bay to Victoria Beach. Parties of prospectors were transported from Victoria Beach to Thicket Portage, Clear Water Lake, Churchill and Tavane Bay, where prospecting activities were undertaken, special flights being made to Chesterfield and Deer Lake, Dud Rocker Lake and Jackfish Isles.

Their total flying time was 288 hours; 144 flights were made and 18,830 miles flown; 4,150 square miles of Northwest Territory, north of latitude 62, was sketched from the air. They operated two Fairchild F.C.2 float seaplanes and one D.H. 60X Moth. Three pilots were employed.

DeHAVILLAND AIRCRAFT OF CANADA LIMITED

A Flying Training School is conducted by this company at Toronto, in addition to the service and assembly of their Moth aircraft, particulars of which will be found on page 71. Their other activities included exhibition and service flights.

During the year 580 hours were flown, of which 18 hours were on exhibition flying at the Canadian National Exhibition, Toronto, 162 hours on flying instruction, and 399 hours on other operations and service flying; 861 flights were made and 46,500 miles flown; 27 exhibition flights were made; 30 pupils were given flying instruction, and 615 passengers carried. One D.H. 60X Moth and one Gypsy Moth, as land and seaplanes, were operated. One pilot was employed.

GILLIES AIR SERVICE

This service was engaged in passenger carrying, flying instruction, exhibition and advertising, at Kitchener, Ontario.

Four hundred and sixty-three hours were flown, of which 372 hours were on passenger carrying, 28 hours on exhibition and advertising, and 63 hours on flying instruction; 942 flights were made and 34,725 miles flown; 737 passengers were carried and 9 pupils given flying instruction. Four exhibition flights, and two parachute descents were made. One Waco 9 aircraft was operated and three pilots employed.

LEAVENS BROS.

Passenger carrying, exhibition, advertising, and flying instruction were the chief activities of this service. An air-harbour is being constructed by them on the Kingston highway, three miles east of Belleville. During the year 487 hours were flown, of which 411 hours were on passenger carrying, 3 hours on exhibition and advertising and 73 hours on flying instruction. They operated one Curtiss "Canuck" and one "Waco" 9 aircraft, and employed two pilots.

LONDON AIR TRANSPORT LIMITED

The air mail service from Leamington to Pelee Island is operated by this company during the winter months, under contract with the Post Office Department. They are also engaged in passenger carrying at London, Ont. Several flights have been made carrying hurt or sick persons from Pelee Island to the main land during the winter for medical attention, there being no other means of communication. During the year the total flying time was 447 hours; 26,820 miles were flown; 1,462 passengers, 6,000 pounds of goods, and 21,966 pounds of mail were carried. Eight parachute descents were made and two pupils given flying instruction. They operated three "Waco" 10 aircraft and employed four pilots.

NATIONAL AIR TRANSPORT LIMITED

This company commenced operations in July, at Toronto, Ont., and are engaged in freight, mail and passenger carrying, and exhibition flying.

A flight over a distance of 800 miles in one day was undertaken for a Toronto newspaper, completing an airport survey of London, Windsor, Cleveland and Buffalo. Another tour was made on behalf of the *Toronto Star*, using their equipment to urge the establishment of airports, and thirteen towns and cities in Ontario were visited. This company owns and operates a Radio Station, and broadcasting from the air was featured during the Canadian National Exhibition at Toronto.

During the year their total flying time was 365 hours; 938 flights were made, and 32,200 miles flown; 1,275 passengers, 1,980 pounds of goods, and 2,102 pounds of mail were carried. They operated one four-passenger "Buhl" Airedan, one two-passenger "Buhl" Special Airedan, and one D.H. 60X Moth aircraft, and employed five pilots.

WESTERN CANADA AIRWAYS LIMITED

In central and northern Manitoba, and in the Patricia district areas of Ontario, this company serves the outlying mining fields, carrying passengers, freight, mail and mining equipment. Fishery patrols are operated on the Pacific coast under contract with the Department of Fisheries. They conduct a Flying Training School, which has been in active operation through the year, and instruction is given on "Moths" and "Avians".

Their Headquarters is at Winnipeg, where the Flying Training School is conducted. The main bases are established at Sioux Lookout, Ontario; Lac du Bonnet and The Pas, Man., and Vancouver, B.C. Post Office air mail contracts over the following routes are operated, weekly: Sioux Lookout-Red Lake area; Lac du Bonnet-Bissett-Wadhope; The Pas-Kississing. An experimental air service was run from December 10 to December 29, over the route Winnipeg, Regina, Calgary, Edmonton, via Saskatoon, under contract with the Post Office Department. A passenger service was maintained for them over this route, the passenger rates being: Winnipeg to Regina, \$52; Regina to Calgary, \$69; Winnipeg to Calgary, \$121; Calgary to Edmonton, \$27; Edmonton to Saskatoon, \$50; Saskatoon to Winnipeg, \$71; Edmonton to Winnipeg, \$121; full round trip, \$242. There has been much traffic from their bases at The Pas, Lac du Bonnet, and Sioux Lookout, mainly in the shipping of all kinds of supplies, mail and foodstuffs in the mining fields.

In central Canada, the aircraft used are "Fokker Super-Universals," "Fokker Universals," "Fairchild's," "Moths," and "Avians," which in the main are flown on floats during the summer and on skis during the winter. The light aircraft used for school work are flown on wheels. On the Pacific coast "Boeing" and "Vedette" flying boats are operated.

In the Cold Lake district, north of The Pas, during July and August, their aircraft were used in the attempt to find a prospector who had been lost since June 26. The prospector was located on August 14, and immediately flown into The Pas.

On August 19 an aircraft was flown 225 miles into the desolate region in the vicinity of Nelson House, and brought out to The Pas an Indian who had been badly mauled by a brown bear.

The above are two of many kindred acts performed by this company in the course of their work in the north.

At the request of a Mining Syndicate, a flight was undertaken with a Super-Universal, piloted by C. H. Dickins. The purpose of the flight was to obtain information as to the conditions under which prospecting parties were working. The trip took 40 flying hours, spread over 12 days and covered 4,000 miles, and is the longest series of continuous flights ever made in Canada. Much of the country traversed is in the sub-Arctic, and is uninviting, barren and desolate. Fog and wind storms were encountered, but the flight was completed successfully and without mishap.

The aircraft left Winnipeg on August 28 and flew to Norway House; from Norway House along the Nelson river to Jackfish Isles, thence to Churchill on Hudson bay; from Churchill along the shores of the Hudson bay to Mistake Bay and Corbet Inlet to Chesterfield Inlet, and west to Baker Lake, north of latitude 64. From Baker Lake west and south, over the Barren Lands, following the course of the Dubawnt river as far as Wholedia Lake; west over the height

of land to Stony Rapids to Lake Athabaska, and onwards west and north to Fort Smith on the Slave river; returning by Fort Chipewyn, Stony Rapids, Reindeer Lake, Cold Lake, The Pas and south to Winnipeg.

A flight was also undertaken with a Super-Universal, piloted by A. H. Farrington, for the purpose of bringing out prospectors and employees of a Mining Syndicate. Starting from Winnipeg on August 12 the first stage of the flight was to Norway House, thence to Jackfish Isles, to Deer Lake and to Eskimo Point on the Hudson bay, a distance of 1,025 miles; from Eskimo Point a number of local flights were made. The aircraft returned by Deer Lake and Norway House to Winnipeg. The total distance flown on this flight was 2,195 miles. Other special flights, similar in nature, were undertaken.

A flight from Hudson, Ont., in connection with the Indian Treaty was also completed without incident during August and September; stops were made at Canabrough House, Fort Hope, English River, Albany, Attawatskat, Moose Post, Remi Lake and return to Hudson.

A winter service is in operation down the Mackenzie River from Waterways to Fort Simpson, with stops at Fort Chipewyan, Fort Smith, Fort Fitzgerald, Fort Resolution, Hay River and Fort Providence. A Fokker Super-Universal is used and weekly trips are made carrying passengers and mails.

During the year 9,964 flights were made. The total flying time was 6,870 hours; 545,009 miles were flown; 9,647 passengers; 1,192,057 pounds of goods and 122,170 pounds of mail were carried. Fifteen exhibition flights were made and 27 pupils given flying instruction. They operated 1 Fokker Trimotor, 11 Fokker Universals, 7 Fokker Super-Universals, 1 H.S.2.L. flying boat, 2 Boeing B.1.E. flying boats, 1 Fairchild Cabin Monoplane, 1 D.H. 61, 1 D.H. 60X Moth, and 5 Avro Avian aircraft. Thirty pilots were employed.

NORTHERN AERIAL MINERALS EXPLORATION LTD.

N.A.M.E., Toronto, Ont., is classified as a commercial operating company, but their flying activities are distinct from most commercial operators in that there is no direct revenue from the operation of their aircraft.

The fleet of aircraft of the company is used for the sole purpose of more effective prospecting.

Flying operations commenced in the middle of May, but before that organization of an efficient staff, and the purchase of suitable aircraft, transporting the new aircraft from manufacturing centres to the scene of their operations, an average distance of 1,500 miles, and establishing fuel caches at strategical centres to permit the uninterrupted operation of their aircraft in any part of northern Canada, had to be undertaken. As some of the fuel caches were in very remote localities, it required many months to transport the fuel to its destination. One shipment, which left the Railhead in May, 1928, should be at its destination by June, 1929. The organization of the mining activities required similar attention. Parties of Geologists, Field Engineers and Prospectors were completely equipped with all necessities, including 16-foot sectional canoes, and placed in chosen localities from Ungava to the Yukon.

The company's operations—flying and mining, were carried on in four main districts. Patricia District, Ontario, with headquarters at Hudson; northern Manitoba, with headquarters at The Pas; Alberta and Northwest Territories with headquarters at Edmonton, and east coast Hudson's bay and Ungava, with headquarters at Richmond Gulf.

Special flights carried out in addition to the regular flying in the Patricia district and northern Manitoba were as follows:—

From New York to head waters of South Nahanni river and area in S.E. Yukon, via Winnipeg, The Pas, Manitoba; Fort McMurray, Alberta; Fort Resolution and Fort Simpson, N.W.T. This involved flying over unmapped



PROSPECTORS AND CREWS OF PLANES AT REMI LAKE



ABOUT READY TO START FOR CHURCHILL FROM CACHE LAKE

mountainous country, rough mapping of the country by air sketching, establishing of caches in the interior at suitable points, by air, in addition to transporting nine prospectors and supplies in various points in the area. The aircraft used were one Fokker-Universal and one Fairchild Monoplane.

From Winnipeg to Baker Lake via The Pas, Fort Churchill, Cape Eskimo, Chesterfield Inlet. This included considerable flying from Baker Lake, landing prospectors and supplies by air in various parts of the Barren Lands within a radius of 200 miles. The aircraft used were one Fokker-Universal and one Loening Amphibian.

From Baker Lake around the Bay to Richmond Gulf, which included considerable flying into the interior from points along the east coast. One Loening Amphibian was used on this operation.

A flight was made from Baker Lake to Fort Churchill on October 9, just before the freeze up, in a Fairchild Monoplane. Taking off in stormy weather the seaplane damaged a float and turned turtle. It was salvaged and rebuilt. Another aircraft flew from The Pas to Churchill via Nelson and the coast, to bring out the crew and to assist in the search for the tug *Yates*, missing from Churchill.

A total of thirty-three fuel caches have been established, and the company is able to place prospectors in any part of continental Canada at a day or two's notice.

A permanent base is being established at Sioux Lookout for eastern operations. Hangars and work shops are being erected and will be their maintenance headquarters when completed.

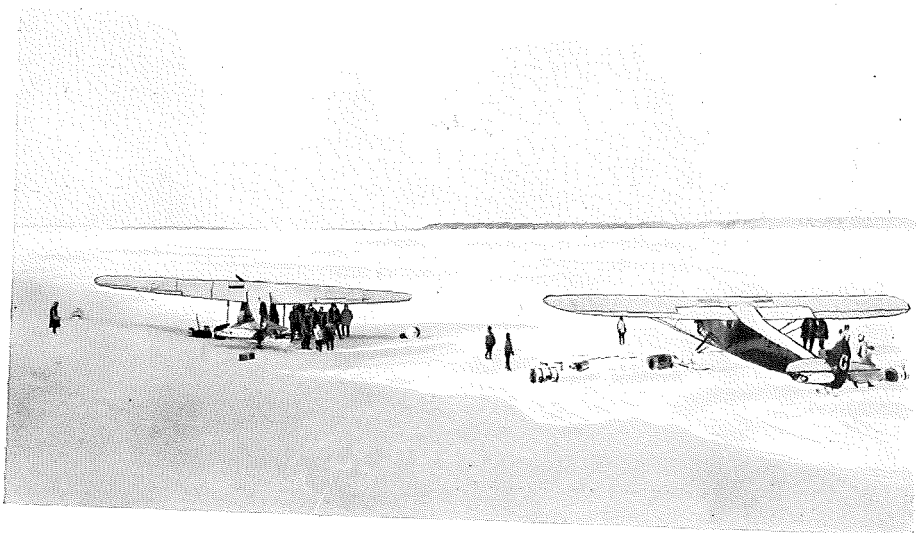
During the year 746 flights were made. The total flying time was 1,178 hours; 97,568 miles were flown; 126,964 pounds of goods were carried. Six pupils were given instruction. They operated one Fairchild F.C.2. Monoplane, two Fairchild F.C.2. W.2. Monoplanes, one Fokker Super-Universal monoplane, one Loening Amphibian, and one D.H. 60X Moth seaplane. Eight pilots were employed.

PROSPECTORS AIRWAYS LIMITED

This company, consisting of prospectors and mining engineers, established a base at Haileybury, Ontario, and used aircraft as an aid in locating mineral deposits in Quebec, Ontario, Manitoba, and Saskatchewan.

A Fairchild F.C.2. Monoplane was specially built to transport a collapsable canoe, 1½ horsepower engine, rifle, fishing lines, tent, bedding, prospecting equipment, cooking utensils, and four weeks' food, together with two passengers, and operated as a self-contained unit throughout the season, most flights being made over unexplored and unmapped territory as far as 500 miles north of the railways. Bush fires were general throughout northern Saskatchewan and Manitoba, and made flying hazardous. Gasoline was relayed by air to enable them to operate north of the Fond du lac and east of Reindeer Lake. This method of prospecting has enabled many years' work to be accomplished in one season by reducing the travelling time to hours instead of months, and, most important, the elimination of unfavourable geological formation where rock exposures occur.

During the year 170 flights were made. The total flying time was 192 hours; 15,700 miles were flown; 30,500 pounds of goods were carried. They operated one Fairchild F.C.2. Monoplane, and employed one pilot and one air engineer.



EAST MAIN RIVER



"FOKKER" IN ICE ON JAMES BAY

SKYVIEW LINES LIMITED

An air sight-seeing service over Niagara Falls, Ontario, was operated by this company from May 24 to September 24. An aerodrome was established at Chippawa, and trips were made down the Niagara river and over the Horse-shoe falls. The aerodrome was lighted for night flying so that passengers could be flown to observe the illumination of the falls in the evenings. An average of ten trips daily, were made.

During the season 295 hours were flown and 10,468 passengers carried. They operated a Ford Trimotor Passenger Model 4 A.T., powered with Wright J.5. engines. Four pilots were employed.

COMMERCIAL AIRWAYS OF REGINA, LIMITED

This company conducts a Flying Training School at Regina, Saskatchewan. Passenger flights were also carried out to various points in this province.

During the year 1,750 flights were made. The total flying time was 429 hours; 1,040 passengers were carried and 20 pupils given flying instruction. They operated one American Eagle Biplane aircraft and employed one pilot.

GREAT WESTERN AIRWAYS LIMITED

The activities of this company comprise the transportation of passengers and express, and a Flying Training School in Calgary, Alberta. They amalgamated with the Purple Label Air Lines in August. Passenger trips to the foot of the Rocky Mountains, a distance of 100 miles, and to the Prince of Wales Ranch, 100 miles, the fare being \$25 for each trip, also to the Turner Valley Oil Fields, fare \$20, and sight-seeing rides over the city, are arranged as required. Their aircraft were used tracing oil strata from the air, under contracts with oil operators. One operator reported that in two hours he accomplished a survey which would ordinarily have taken two weeks, and that air observation was very effective. Another oil operator stated that in one hour, from the aeroplane, he located and traced a structure that ground parties had been intermittently in search of for three years. Trips were made into the interior of British Columbia, Alberta, and Saskatchewan.

During the year 3,000 flights were made. The total flying time was 755 hours; 41,000 miles were flown; 1,608 passengers were carried; 2,200 square miles were explored from the air, and 600 square miles of oblique photography were done. They operated one Stinson-Detroit S.B.1 Biplane and two D.H. 60X Moth land planes. Three pilots were employed.

COMMERCIAL AIRWAYS OF EDMONTON, LIMITED

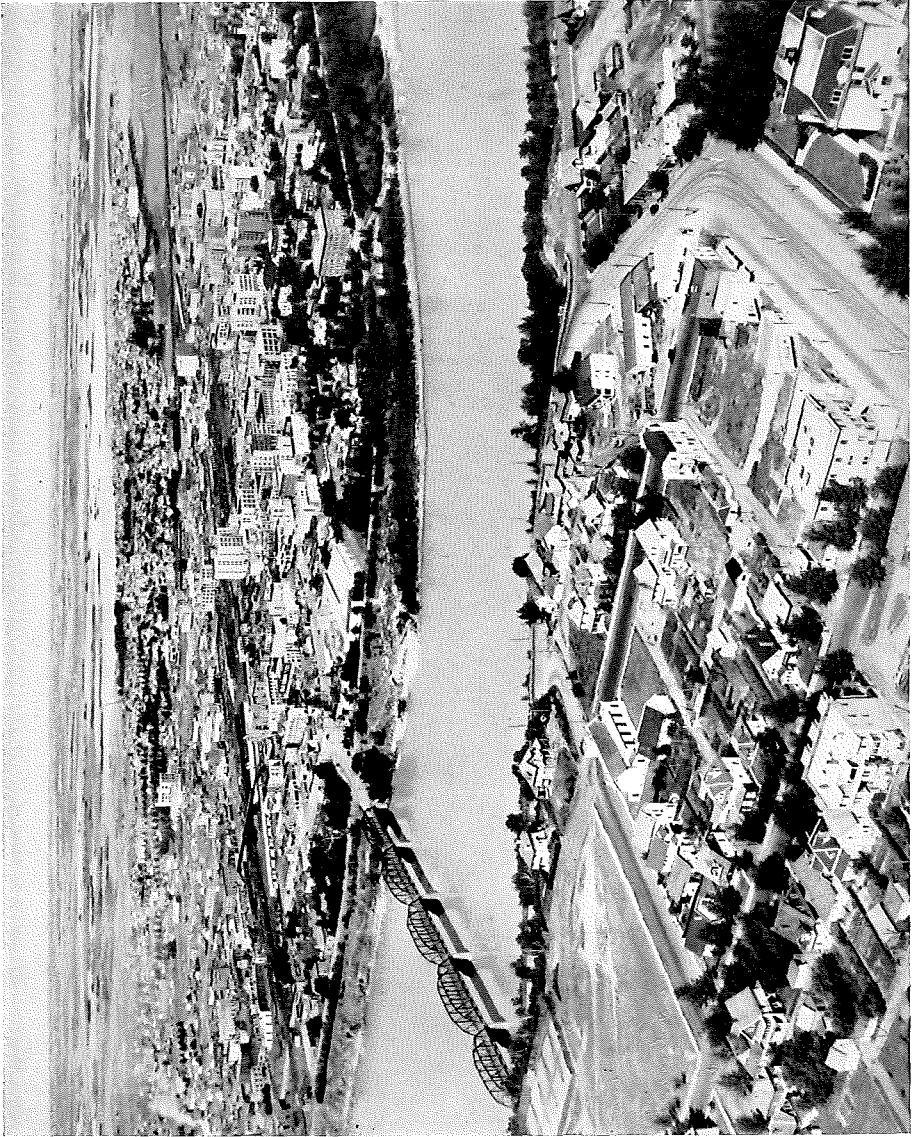
Operations of this company commenced in August on passenger carrying and instruction. A flight of 400 miles was made from Edmonton to Fort Vermillion on the Peace river, carrying anti-toxin for the provincial Department of Health during an outbreak of diphtheria. The weather was 30 degrees below zero and the Cirrus Avro Avian was satisfactorily operated on this flight.

In addition to passenger carrying, 300 square miles of oblique photography was done in the vicinity of Edmonton.

During the period of activities 250 flights were made; 250 hours and 17,500 miles flown; 600 passengers were carried and 2 pupils given flying instruction. One Avro Avian was operated and two pilots were employed.

DOMINION AIRWAYS LIMITED

This company is engaged in passenger and express services, advertising, commercial air photography, mapping and surveying, timber cruising and forest sketching in British Columbia, with headquarters at Vancouver. They also conduct a school of flying training.



SASKATOON, SASKATCHEWAN

The chief operations, other than the school, were in connection with forest patrols for the Forestry Branch of the British Columbia Department of Lands. For particulars see page 44.

During the year 431 flights were made. The total flying time was 268 hours, and 21,230 miles were flown; 424 passengers were carried, 3,000 square miles were explored, 3,000 square miles sketched from the air, and 25 square miles of vertical photography done. Twenty pupils were given flying instruction. They operated 1 D.H. 60X moth seaplane and employed one pilot.

TREADWELL YUKON COMPANY LIMITED

A regular passenger, mail, and express service is operated by this company from Whitehorse to Dawson, Yukon Territory. Their headquarters are at Wernecke. During the year special trips were undertaken in connection with mining and exploration, as required.

Operations were commenced in September, and during this period, 66 flights were made. The total flying time was 140 hours; 12,522 miles were flown; 44 passengers, 4,113 pounds of goods, and 14,718 pounds of mail were carried. They operated one Fairchild F.C.W.2., and one D.H. 60X Moth aircraft, and employed two pilots.

YUKON AIRWAYS AND EXPLORATION LIMITED

This company operated a passenger and mail service in the early part of the year between Whitehorse, Dawson, Mayo, and Keno, Yukon Territory, and also between Carcross, Y.T., and Atlin, B.C., using a Ryan B.1. This aircraft was seriously damaged when the machine struck a tree in attempting to land on May 5, which resulted in this service being abandoned. Activities were resumed later with an Eaglerock on short passenger flights in various parts of British Columbia and was flown to Whitehorse in December where trips were made to Dawson during the winter. It is interesting to note that ordinarily, on the ground, when the temperature is 40 degrees below zero, at an altitude of from 2,000 to 5,000 feet, the temperature ranges from zero to 10 degrees above zero.

During the year 699 flights were made, 193 hours and 13,770 miles flown; 1,359 passengers, 2,430 pounds of goods, and 1,450 pounds of mail were carried. One Ryan B.1. and One Eaglerock A.1. were operated. Three pilots were employed.

OTHER OPERATORS

A. H. Munday operated an Avro Avian carrying 25 passengers on short flights at Thorold, Guelph, and Barrie, Ontario.

Roydon Foley engaged in demonstration and pleasure flights at Hamilton, Ontario.

William H. M. Drury was engaged in passenger carrying at St. Catharines. One hundred and twenty-three flights were made, 99 hours flown, and 120 passengers carried. A special flight was made from Windsor to Los Angeles, taking part in the International Air Derby, flying a Waco fitted with Wright J.5 engine, which was won by Mr. Drury.

Canadian Air Express operated 2 D.H. 60X Moth aircraft and were engaged in passenger carrying in Toronto, Ontario. They were merged into International Airways Limited towards the end of the year. Three hundred and fifty flights were made and 190 hours flown; 410 passengers were carried. The total number of miles flown was 16,000.

T. F. Williams engaged in short flights and flying instruction at Woodstock, Ont. He operated one Standard J.1. and an Eaglerock Biplane. Three hundred and seven flights were made, 132 hours flown, 273 passengers were carried, and 18 pupils were given flying instruction.

Harry E. Taggart operated a Curtiss J.N.4, and was engaged in short passenger flights; 760 flights were made, 150 hours flown, and 600 passengers carried.

R. B. Lloyd operated a Standard J.1., carrying passengers between Toronto and Brockville; 200 hours were flown, 400 flights made, and 225 passengers carried.

Norman A. Thompson operated a Lincoln Page aircraft at Chatham, Ontario, and was engaged in passenger carrying, exhibition advertising and flying instruction; 69 hours were flown, 215 flights made, 196 passengers carried and 2 pupils given flying instruction.

Cherry Airways Limited operated a Pheasant Land Biplane in Saskatchewan and Manitoba, on passenger carrying; 300 hours were flown, 420 flights made, 24,000 miles flown, and 1,213 passengers carried.

Universal Air Industries Limited operated 1 Swallow and one Curtiss aircraft at Regina, Sask., on short passenger flights; 291 hours were flown, 945 flights made, 24,363 miles flown, 1,477 passengers carried, and 4 pupils given flying instruction.

J. H. Holley operated an Avro Avian aircraft at Winnipeg; 150 hours were flown, 1,051 flights made, 1,450 passengers carried, and 8 pupils given flying instruction.

The Duncan Motor Company of Regina, Sask., are the western distributors for the Mono Aircraft line and operated a Monocoupe in connection with the distribution of the Mono aircraft, and also for the sale of their motor cars; 238 hours were flown, 450 flights made, and 294 passengers carried.

Anderson Brothers were engaged in short passenger trips in Saskatchewan and Alberta. They operated a Standard J.1. aircraft; 311 flights were made, 105 hours flown, and 537 passengers carried.

W. A. Del Bigio operated an American Eagle aircraft in the vicinity of Winnipeg, Man.; 569 passengers were carried, 159 hours, and 13,853 miles flown.

CHAPTER 5

AIR MAILS

In December, 1927, the first regular contract air mail services were inaugurated in Canada by the Post Office Department. For some years previously the Post Office allowed commercial aviation companies to carry mail to the remoter parts of the country, but no contracts had been let. The success of these services and the regularity with which they were operated under difficult conditions, with no assistance or subsidy from the Government, proved the possibility of all-the-year-round operation of air mail routes in Canada.

The problem divides itself into two parts: first, the carriage of mail by air into districts which, either from their location or from natural conditions, are relatively inaccessible by other means; and, second, the inauguration of regular, scheduled services between the main centres of population in the Dominion. In the first class are districts such as the Yukon and Mackenzie basin, remote communities in all provinces, new mining camps, islands isolated in winter, etc. Such localities do not require, in most cases, a daily service and their ground services are so slow and uncertain that their claims for consideration are indisputable. Though the difficulty attending the operation of services to many such localities in Canada is considerable, yet the fact that only occasional trips are necessary, and that the services do not call for a scheduled run simplifies the problem, since it is permissible in such cases to wait for fine weather.

The following services have been provided by the Post Office Department, under contract with commercial operating companies:—

WINTER SERVICES

Moncton-Magdalen Islands; Quebec-Seven Islands-Anticosti; Leamington-Pelee Island.

SUMMER SERVICES

Rimouski-Montreal-Ottawa; Lac du Bonnet-Bissett-Wadhope.

YEARLY SERVICES

Montreal-Albany; Montreal-Toronto; Sioux Lookout-Red Lake District; The Pas-Kississing.

The particulars of these services are as follows:

WINTER SERVICES

In effect during the season of closed navigation.

Leamington-Pelee Island, Ont.

Distance—22 miles.

Frequency—daily, except Sunday.

Contractors—London Air Transport, Ltd.

Quebec-Seven Islands via Betsiamites, Pointe aux Outardes, Franklin, Godbout, Trinity Bay, Pentecost, Shelter Bay and Clarke City.

Distance—350 miles.

Frequency—Two trips per week, 34 round trips per season.

Contractors—Canadian Transcontinental Airways Ltd.

Seven Islands-Anticosti Island

Distance—120 miles.

Frequency—Two round trips per month during December, January, February and March.

Contractors—Canadian Transcontinental Airways Ltd.

Moncton-Magdalen Islands

Distance—200 miles.

Frequency—Weekly, seventeen round trips per season.

Contractors—Canadian Transcontinental Airways Ltd.

The contract provides for the performance of two trips per week along the north shore of the St. Lawrence to Seven Islands, and two trips per month to Anticosti Island while a weekly service is to be performed between Moncton and Magdalen Islands. The Post Office Department does not insist upon a rigid adherence to any definite schedule regarding the days of service for the conveyance of mail by air in these localities in view of the extreme weather conditions which obtain during the winter season.

Moncton-Charlottetown

Distance—110 miles.

Frequency—Weekly, on Saturday.

Contractors—Canadian Transcontinental Airways Limited.

During the winter season 1927-28 there was a weekly trip performed between Moncton and Charlottetown in order to overcome the delay in the delivery of mails on Saturday throughout Prince Edward Island occasioned by the inadequate ferry service on that day which resulted in the mails being held up until the following Monday. The air mail service on Saturday overcame this by securing delivery in Charlottetown of the mails from Moncton and from the Maritime Provinces generally on Saturday evening, and made it possible to despatch the mails throughout Prince Edward Island on Saturday Evening trains.

SUMMER SERVICES

Rimouski-Montreal

Distance—330 miles.

Frequency—Two trips per week each way, performed in connection with incoming and outgoing trans-Atlantic steamships, saving in time ranging from 24 to 96 hours—two despatches and one receipt per week, the second trip per week from Rimouski being performed in connection with the westbound train from Halifax and accomplishing a saving of about 18 hours in the delivery of Maritime mails in Montreal.

Contractors—The Canadian Transcontinental Airways Limited, Quebec.

Duration of Service—During season of navigation of 30 weeks, involving the performance of 120 single trips.

Date of establishment—May 5, 1928. The last receipt from Rimouski for the present season took place on the 27th November, 1928, while the last despatch to Rimouski was made on November 29.

Montreal-Ottawa

Distance—110 miles.

Frequency—One trip per week each way, to connect at Montreal with the Montreal-Rimouski plane.

Contractors—The Canadian Transcontinental Airways Limited, Quebec.

Duration of Service—During the season of navigation of 30 weeks involving the performance of 60 single trips.

Date of establishment—May 5, 1928.

Lac du Bonnet-Bissett-Wadhope

Distance—82 miles.

Frequency—semi-weekly—trip performed on Mondays and Fridays.

Contractors—Western Canada Airways, Limited, Winnipeg.

This serves the mining district in southeastern Manitoba, during the summer months.

YEARLY SERVICES

Montreal-Toronto

Distance—330 miles.

Frequency—Six trips per week each way.

Contractors—Canadian Airways Ltd., Montreal.

Date of establishment—May 5, 1928.

This service was inaugurated on May 5, 1928, with a frequency of 2 trips per week each way, in connection with incoming and outgoing trans-Atlantic steamships—connecting at Montreal with the plane to and from Rimouski.

On October 1, 1928, the frequency was increased to daily, except Sunday. The following is the time schedule in connection with this service:—

Leave Toronto, 8.30 a.m.

Arrive Montreal, 11.45 a.m.

Leave Montreal, 11.15 a.m.

Arrive Toronto, 2.15 p.m.

Montreal-Albany

Distance—200 miles.

Frequency—Six trips per week one way, the return trip being performed under U.S.A. New York-Albany-Montreal Service.

This service was inaugurated on October 1, 1928, the United States Post Office Department inaugurating on the same date an air mail service from New York and Albany to Montreal. The time schedules have been so adjusted as to secure the maximum benefits from this service.

Leave Montreal, 12.15 p.m.

Arrive Albany, 2.30 p.m.

U.S.A. Plane—Leave New York, 7 a.m.

Arrive Albany, 8.30 a.m.

Leave Albany, 8.45 a.m.

Arrive Montreal, 11.15 a.m.

With regard to the Montreal-Albany service, it will be observed that by the plane leaving Montreal at 12.15 it permits a connection being made with the plane from Toronto to Montreal. The arrival of the plane at Albany at 2.30 permits the conveyance of the air mail by train to New York, reaching the latter point in time to connect with the outgoing night planes from New York, namely the overnight run from New York to Chicago, reaching Chicago the first thing the following morning, and the plane from New York to Atlanta.

Kississing—The Pas

Distance—100 miles.

Frequency—weekly—trip performed on Friday.

Contractors—Western Canada Airways Limited, Winnipeg.

This serves the newly developed Cold Lake mining district.

Sioux Lookout, Gold Pines, Red Lake, Narrow Lake and Jackson Manion

Distance—320 miles per round trip.

Frequency—weekly—trip usually performed on Wednesday, with an occasional variation due to weather conditions.

Contractors—Western Canada Airways Limited.

This service is operated throughout the Red Lake mining district in northern Ontario. Prior to the inauguration of an air mail service, mail was conveyed into this district by means of canoes and dog teams.

During the year, 316,631 pounds of mail was conveyed, of which 277,184 pounds was carried under Post Office Contracts, the distance covered by contractors being approximately 182,000 miles. The services have been interrupted on occasion by bad weather conditions and forced landings, but no accidents have occurred and the mail has been conveyed successfully during this period. The communities fully appreciate and are making use of the new form of transport. A new five cent special air mail stamp was issued by the Post Office on October 1, to be used on all letters weighing one ounce; for each additional ounce extra air mail stamps are required.

The volume of mail carried by contractors each month is as follows:—

	Pounds
January, 1928.....	11,991
February, 1928.....	14,572
March, 1928.....	17,728
April, 1928.....	9,071
May, 1928.....	23,362
June, 1928.....	24,122
July, 1928.....	24,552
August, 1928.....	26,028
September, 1928.....	28,792
October, 1928.....	30,449
November, 1928.....	37,610
December, 1928.....	28,907
Total.....	277,184

SPECIAL SERVICES

In addition to the regular mail contracts, special services have been authorized by the Post Office, the details of which are as follows:—

Whitehorse-Dawson, Y.T.

The Treadwell Yukon Company Limited, were granted permission by the Post Office to convey mail over their passenger and express route, from Whitehorse to Dawson, Y.T., all letters being carried at a charge of 25 cents for each ounce or fraction thereof, special Air Mail "Stickers" being affixed to each letter.

Waterways—Fort Simpson

A similar service is being operated during the winter months from Waterways to Fort Simpson on the Mackenzie river, a distance of about 850 miles, with occasional extension to Good Hope, on the Arctic Circle.

EXPERIMENTAL SERVICES

Winnipeg-Edmonton-Calgary

Early in 1928 the Postmaster General caused inquiry to be made as to the advisability of air mail services between Calgary, Edmonton and Winnipeg, with the result that authority was given for a series of experimental flights between these points, to establish the practicability, or otherwise, of such air mail services, to draw the attention of the Prairie Provinces forcibly to the advantages of rapid air mail transportation, and to demonstrate to what extent the mailing public generally would actually patronize the service.

Most careful thought was given to the planning of the experimental service and multitudinous details worked out.

Western Canada Airways Limited were entrusted with the performance of the experimental service and used "Fokker Universal" and "Fokker

Super-Universal" aircraft. The flights began on December 10, 1928, and were continued daily, except Sunday, up to and including the 29th, on the basis of the following schedule:—

Westbound

Leave Winnipeg 9.15 a.m., taking mail from westbound mail train arriving Winnipeg 8.45 a.m.
Arrive Regina 12.15 p.m.
Leave Regina 12.30 p.m.
Arrive Calgary 4.15 p.m. Connecting with westbound train leaving Calgary at 5.40 p.m.
Arrive Saskatoon about 1.30 p.m.
Leave Saskatoon about 1.45 p.m.
Arrive Edmonton 5.15 p.m.

Eastbound

Leave Calgary 7.00 a.m.
Arrive Regina 11.30 a.m.
Leave Edmonton 7.00 a.m.
Arrive Saskatoon about 10.15 a.m.
Leave Saskatoon about 10.30 a.m.
Arrive Regina 11.45 a.m.
Leave Regina 12.00 noon.
Arrive Winnipeg 4.15 p.m. in time to connect with eastbound and southbound mail trains.

Only first class matter, prepaid at the air mail rate of 5 cents for the first ounce and 10 cents for each succeeding ounce or fraction thereof was conveyed by these flights. Registered mail was carried in addition to ordinary first class matter.

The mail conveyed from Edmonton and Calgary to Regina was merged at Regina and one plane conveyed the combined mail to Winnipeg. Similarly, one plane operated between Winnipeg and Regina, and separate planes between Regina and Calgary, Regina and Saskatoon, and Saskatoon and Edmonton. The service was thus roughly in the form of a Y—a shuttle between Winnipeg and Regina, and branches between Regina and Calgary, and Regina, Saskatoon and Edmonton.

The weather conditions were very bad during the period of these experimental flights. Strong head winds, and fog (an unusual condition on the prairies), and heavy snow storms, caused forced landings at various points, and only three flights were possible over the whole section. The result of these experiments proved conclusively that in order to make good connections, night flying is essential and the department has under consideration the lighting of these routes during 1929.

During the period of experiments, 2,526 pounds of mail, representing almost 250,000 letters, were carried, and the mileage covered was 35,540 miles. In spite of bad weather conditions, the experiments were a pronounced success.

Ottawa-Montreal-St. John-Halifax

An experimental service over this route is being run during the present winter in connection with the yearly transmission of transatlantic mails.

SURVEY

Ottawa-Winnipeg

A preliminary survey by air, was made between Ottawa and Winnipeg during August for the purpose of obtaining information that may assist in

selecting the most feasible route for a regular mail service. A Fairchild F.C.2. Seaplane 200-horsepower Wright engine was used. The flying time was 28 hours 01 minutes; estimated distance 2,237 miles.

The routes followed were:—

Westward

Following the Canadian Pacific Railway (Ottawa-North Bay) thence following the Canadian National Railway (North Bay to Brereton, Manitoba, via Cochrane): estimated distance 1,088 miles, flying time 15 hours 24 minutes.

Eastward

Following the Canadian Pacific Railway (Minaki, Fort William, Port Arthur, Nipigon), then Canadian National Railway (Orient Bay, Sudbury, North Bay, Ottawa). Estimated distance 1,149 miles. Flying time 12 hours, 37 minutes.

The nature of the country over these routes affords few sites for air-harbours for landplanes, the country being heavily timbered or rocky. Lakes abound and landing facilities are frequent for seaplanes.

Conditions between summer and winter vary so much that the problem of running an air mail service all the year round, on schedule, across Canada, is a large undertaking which will require some years for its development. Fog, the greatest enemy of airmen, is prevalent on both coasts, but in the interior the weather conditions, notwithstanding occasional blizzards and snow storms in the winter, are favourable for operations. In Eastern Canada as far as the Manitoba-Ontario boundary, if summer operations only are considered, a seaplane could be used with advantage. In winter the surfaces of the lakes are admirable for ski landings. This does not offer a complete solution, however, as the service must be interrupted for several weeks, both in the fall and spring, during the freeze-up and thaw-out periods. After careful study, the conclusion has been reached that to maintain a regular all-the-year-round service means the provision of aerodromes at convenient intervals from coast to coast. This presents no difficulty in the Prairie Provinces, nor in the settled parts of Eastern Canada. In northern Ontario, between North Bay and the Manitoba boundary, however, this plan involves careful surveys of the terrain and considerable expense in making aerodromes. In the mountain section occasional fields, sufficient to provide landing grounds, can be found to run the service with safety.

The services for handling all incoming and outgoing transatlantic mails between Rimouski-Montreal-Ottawa, and Montreal-Toronto, have had the effect of a saving in time of delivery of incoming mails as much as 48 hours, and on some occasions 96 hours have been saved in delivery of mail in England.

The Rimouski-Montreal-Ottawa route is operated during the navigation of the river St. Lawrence, and, in order that the transatlantic mails may be continuously carried by air throughout the year, investigational flights have been made over the route connecting Montreal-St. John-Halifax. The problem, however, is one of considerable magnitude, and the difficulties encountered are the climatic conditions which vary greatly between the terminals, snow lying continuously at Montreal for at least three months, making the use of skis essential, while on the Atlantic coast the ground is often bare. A combined ski-wheel undercarriage, fitted to aircraft, would appear to be necessary before this service can be successfully undertaken. This is a problem of major importance since the same conditions apply to any service run between Toronto and Montreal, or points in the United States and Montreal.

SUMMARY OF CONTRACT AIR MAIL SERVICES FOR THE YEAR 1928

Service	Number of single trips	Mail carried (pounds)	Approximate mileage
Leamington-Felee Island.....	71	21,728	1,562
Quebec-Seven Islands-Anticosti.....	40	23,585	18,800
Moncton-Magdalen Islands.....	7	3,017	14,000
Moncton-Charlottetown.....	8	2,390	880
Rimouski-Montreal-Ottawa.....	94	67,195	41,360
Montreal-Toronto.....	113	44,250	37,290
Montreal-Albany (International).....	158	30,660	31,600
Lac du Bonnet-Bissett-Wadhope.....	98	23,722	8,036
Kississing-The Pas.....	18	3,071	1,800
Sioux Lookout-Red Lake Area.....	82	57,566	26,240
Totals.....	689	277,184	181,568

CHAPTER 6

LIGHT AEROPLANE CLUBS

In 1928 sixteen Light Aeroplane Clubs were organized and received assistance under the approved standard conditions, from the Department of National Defence. A number of other communities responded to the offer of assistance made by the Government, but as provision had been made for sixteen only, those failing to receive the grant were asked to renew their applications in the coming year. It is expected that a further eight clubs will complete their organizations in 1929, and commence operations.

The following fifteen clubs were active during the past year:—

Halifax Aero Club.
Granby Aero Club.
Montreal Light Aeroplane Club.
Ottawa Flying Club Inc.
Toronto Flying Club.
Hamilton Aero Club.
London Flying Club.
Border Cities Aero Club.
Winnipeg Light Aeroplane Club.
Regina Flying Club.
Moose Jaw Flying Club Limited.
Saskatoon Aero Club Limited.
Calgary Aero Club.
Edmonton and Northern Alberta Aero Club.
Victoria Aero Club.

Vancouver received the grant, but owing to the Municipal Aerodrome not being ready, no flying was done during the year.

Ten of these clubs have either purchased or placed an order for an additional aircraft, thus qualifying for the issue from the Government of an extra machine.

The purpose of the offer made by the Government late in 1927, was to increase interest in aviation, place facilities for learning to fly within reach of as many people as possible, and to provide aerodromes in as many localities as possible. The scheme, which is briefly outlined below, has fulfilled all expectations.

- (a) Each club to provide its own flying field.
- (b) Arrange for the services of an instructor and **air engineer**.
- (c) Have at least thirty members prepared to qualify as pilots.
- (d) Have not less than ten members already qualified.
- (e) Each approved club will receive two aeroplanes and engines as an initial grant.
- (f) A further issue annually, for a period of five years, will be made of one aeroplane and engine complete, providing the club purchases an aeroplane of equal value.
- (g) The sum of \$100 will be granted to each club in respect of each member who qualifies as a pilot.

The standard conditions for Light Aeroplane Clubs and Associations will be found under appendix "H," page 116.

Flying began in many localities as soon as the advent of spring made aerodrome preparation possible. Before the end of May, seven clubs were actively

engaged in flying, and as fast as accommodation was provided, aircraft were issued to the remaining approved organizations. The summer season obviously saw most of the flying done, but several clubs operated continuously during the winter season, using skis where snow made this necessary.

Three accidents, involving loss of life, are recorded during the year. One to the Granby Aero Club, in which the pilot instructor was killed and a pupil passenger was severely injured. One at Hamilton Aero Club, in which the pilot was injured, and the air engineer passenger died as a result of injuries. Both these accidents were due to the pilot's attempting evolutions near the ground, which is contrary to air regulations. The third accident occurred to Border Cities Aero Club, in which the pupil fell from the aircraft while taking dual instruction, and was killed.

During the year there are recorded the following damage to aircraft, due to forced landings, fire, etc.

Club	Nature of damage	Number of aircraft
Ottawa.....	Total (1 fire).....	2
Moose Jaw.....	" (1 fire).....	1
Granby.....	".....	1
Winnipeg.....	Serious.....	2
Hamilton.....	".....	1
London.....	Slight.....	1
Edmonton.....	".....	1
Calgary.....	".....	1
Halifax.....	".....	1
Saskatoon.....	".....	1
Montreal.....	".....	3

A summary of Light Aeroplane Club operations for the year, is shown below. It will be seen that 139 pilots' licenses were issued to club members, 28 of which were commercial pilots' licenses. The total membership was 2,400. The total flying time 8,124 hours, 30 minutes; 25,357 flights were made. Ab initio soloists numbered 209. Toronto leads with aggregate figures, their flying time being 1,218 hours 02 minutes; Winnipeg second with 1,003 hours 33 minutes; and Montreal third, with 946 hours 25 minutes.

As a result of Light Aeroplane Club activity, there has been a large amount of touring done by light aeroplane, and a number engaged in exhibitions and contests. Many clubs have held field days. The movement is leading to an increase in the number of owners of private aircraft. Those pilots who have qualified for the commercial license have taken up aviation as a vocation, and are now employed by various operating companies.

SUMMARY OF LIGHT AEROPLANE CLUB OPERATIONS FOR THE YEAR 1928

Name	Com- menced operations 1928	Number of members	Number of aircraft	Under instruc- tion weekly average	Number of Flights					Number of Hours Flown					Licenses		Daily flying time per air- craft
					Test	Dual	Solo	Pass	Total	Test	Dual	Solo	Pass	Total	Pri- vate	Com- mercial	
										Hrs. Min.	Hrs. Min.	Hrs. Min.	Hrs. Min.	Hrs. Min.			
1. Halifax.....	July 6	92	2	10	19	250	94	141	504	3-05	127-10	46-15	30-38	207-08	4	1	1-18
2. Granby.....	June 9	120	2	25	53	190	68	148	459	11-20	92-50	30-34	63-50	198-34	1	.....	0-49
3. Montreal.....	May 12	241	4	115	338	1,561	627	378	2,904	74-00	588-00	197-50	116-35	946-25	19	3	1-37
4. Ottawa.....	June 24	100	2	57	119	1,134	524	336	2,113	25-05	452-35	158-50	104-00	740-30	15	2	1-91
5. Toronto.....	May 1	240	4	92	272	1,188	707	182	2,849	55-23	769-28	305-04	88-07	1,218-02	12	10	1-54
6. Hamilton.....	May 24	155	2	39	28	738	217	138	1,121	10-50	373-45	108-25	46-10	539-10	5	3	1-20
7. London.....	July 28	68	2	20	31	370	175	28	604	6-20	157-00	80-20	25-20	269-00	.....	.....	0-86
8. Border Cities.....	Sept. 8	103	2	35	60	374	186	66	686	14-35	198-55	100-46	27-20	341-36	.....	1	1-50
9. Winnipeg.....	May 25	252	3	27	149	4,035	2,676	526	7,386	16-42	416-00	415-34	155-17	1,003-33	17	2	2-10
10. Regina.....	May 29	128	2	35	22	998	494	12	1,526	3-50	327-45	151-20	20-15	503-10	10	2	1-16
11. Moose Jaw.....	May 23	200	2	30	52	528	207	35	822	29-20	288-50	107-40	111-10	537-00	9	2	1-21
12. Saskatoon.....	May 4	150	2	30	196	1,087	317	295	1,895	45-40	427-10	147-20	106-25	726-35	6	1	1-60
3. Calgary.....	Sept. 15	310	2	54	134	486	113	74	807	38-35	235-00	49-00	26-55	349-30	9	1	1-85
14. Edmonton and Alberta..	June 12	144	2	15	71	948	173	32	1,224	14-30	324-30	65-40	11-05	415-45	4	.....	1-02
15. Victoria.....	July 8	100	1	14	17	311	68	61	457	3-29	92-04	18-49	14-10	128-32	.....	.....	0-73
Totals.....	.....	2,403	34	.....	1,561	14,698	6,646	2,452	25,357	352-44	4,841-02	1,983-27	947-17	8,124-30	111	28	.....

CHAPTER 7

PROVINCIAL OPERATIONS

The conservation and development of our natural resources has been the principal outlet for flying in Canada. The provinces which control their own natural resources are vitally interested in this problem and use aviation as an auxiliary to their ground organizations. The natural resources of the Prairie Provinces, Manitoba, Saskatchewan and Alberta, are still controlled by the Dominion Government. In these provinces the Department of National Defence has provided the air services required. In British Columbia and Quebec the flying has been done by commercial firms under contracts from the provincial authorities. In Ontario the Provincial Government maintains its own Air Service as a branch of the Department of Lands and Forests.

BRITISH COLUMBIA

Dominion Airways Limited carried out fire protection patrols in Okanagan district under contract with the Forestry Branch of the provincial Government of British Columbia from a base at Nelson. About 200 square miles of territory was patrolled, and 96 hours were flown.

QUEBEC

Canadian Airways Limited carried out vertical photography covering an area of 1,500 square miles, under contract with the Department of Lands and Forests of the provincial Government of Quebec, in the Lake St. John district. They also photographed 600 square miles of the Laurentide Park, situated between Bay St. Paul and Chicoutimi, on the north shore of the St. Lawrence river.

The Compagnie Aerienne Franco Canadienne continued vertical photographic operations in the Gaspé peninsula, under contract with the provincial Government. An area of 7,550 square miles was photographed. The company operated from a base established at Gaspé Basin. Two hundred and fifty-five hours' flying time was occupied on vertical photography.

ONTARIO

The Ontario Provincial Air Service was established in 1923 and is maintained by the Ontario Provincial Government to carry out forest fire detection and suppression patrols, forest survey, inventory work, and transportation in remote districts.

The year 1928 was the most successful yet experienced by this service.

The area lying west and north of the Ottawa river, lake Nipissing, and French river was greatly extended in the western part of the province, the new territory embraced being from Port Hope, at the eastern end of the division, to the Manitoba boundary in the western end, and to the Berens river in the northern end.

Fire detection and suppression patrols were carried out in these districts as well as the maintenance of supplies and equipment for rangers and radio posts. Forest sketching was carried out in the Favourable Lake district.

The main base is at Sault Ste. Marie, where a large and completely equipped hangar has been erected, with workshops and storerooms. The area under fire patrol is divided into three districts, with headquarters at Sudbury,

Orient Bay and Sioux Lookout. Substations are situated at Oba Lake, Remi Lake, Biscoe, Timagami, Pine Ridge, Kenora, Fort Frances, Shebandowan and Longlac.

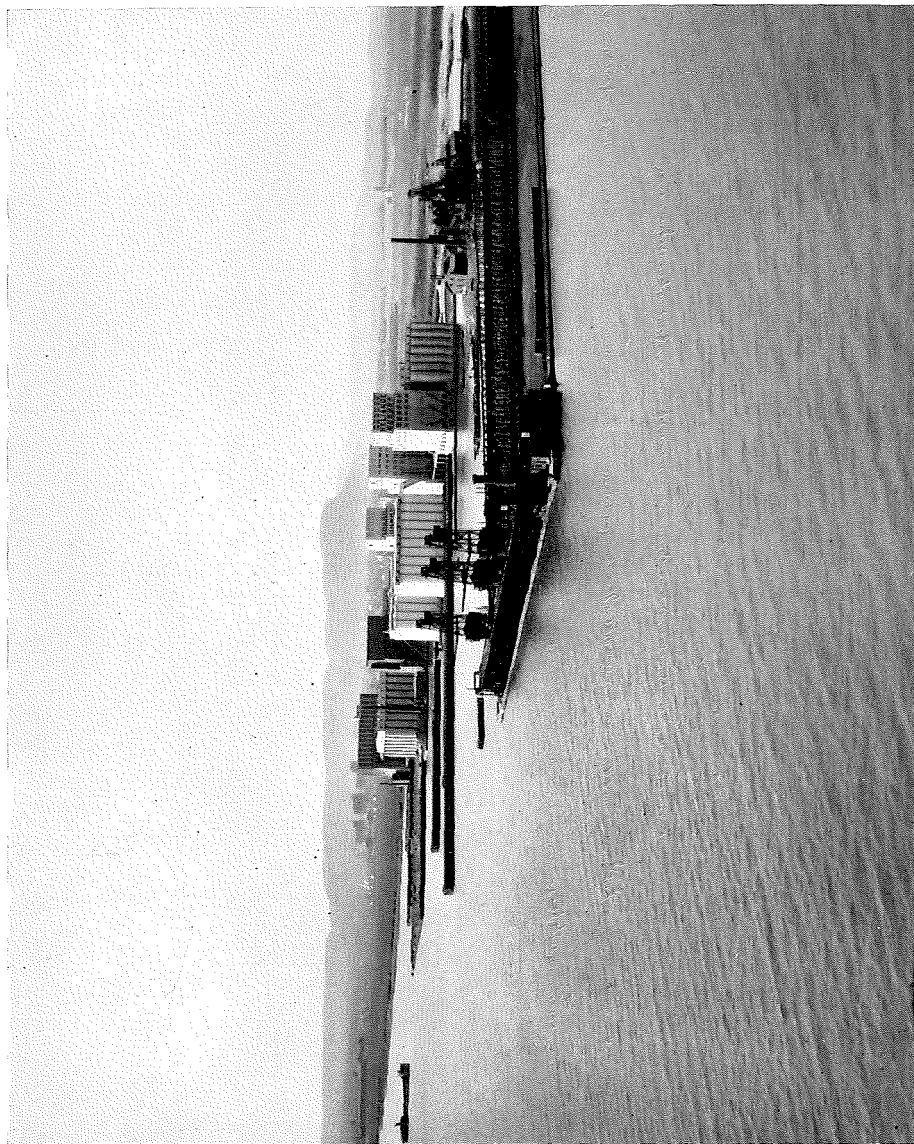
The base at Sioux Lookout was improved by the erection of a new slipway. A large hangar, capable of housing five light aircraft, together with aircraft and engine workshops, was constructed so as to be suitable for reconditioning and readily adaptable for use as a winter flying base. The base at Pine Ridge was moved to Goose Island on Lac Seul, at the end of the season and a new permanent building erected. At Oba Lake, Sudbury, and Remi Lake, improvements were also made.

The whole northern part of the province has been equipped with adequate refueling bases and air travel, by seaplane in summer and by skis in winter, throughout its whole extent is easy. Each sub-base has been chosen so as to give good mooring and beaching ground, convenient to a railway. Permanent camps are maintained during the operating season, which are used by the forest and air service personnel working in the districts.

The Air Service is year by year becoming more firmly knit into the organization for the development and conservation of the resources of the northern part of the provinces. The increased mining and prospecting activities in northern Ontario have raised the fire hazard and make necessary a more intensive organization for forest protection. Nineteen hundred and twenty-nine will see the extension of fire patrols into still remoter parts of the province.

During the season, 4,300 square miles of territory were sketched from the air; 200 square miles of vertical and 4,600 square miles of oblique air photography was carried out; 85 forest fires were detected; 11 pupils were given flying instruction; 4,211 flights were made, and a total of 6,227 hours, 35 minutes flown; 193 hours were carried out on flying instruction, 4,156 hours on forest fire protection and sketching, 6 hours on vertical and 157 hours on oblique photography, 1,715 hours on transportation and other service flying; 2,606 passengers and 763,432 pounds of goods were carried.

The aircraft operated were 11 HS. 2L. flying boats, 10 DH 60X Moth seaplanes and 1 DH. 61 seaplane; 20 pilots and 20 air engineers were employed.



CANADIAN NATIONAL RAILWAY, DOCK 5, PORT ARTHUR.

CHAPTER 8

DIRECTORATE OF CIVIL GOVERNMENT AIR OPERATIONS

The Director of Civil Government Air Operations is responsible to the Deputy Minister of National Defence for the administration and control of all civil air operations required by any department of the Government.

During 1928 the following departments availed themselves of aircraft for a wide and varied range of services:—

Department of Interior.—Forest fire detection and suppression covering 64,534,563 acres of forest land was carried out for the Forestry Branch in Manitoba, Saskatchewan and Alberta. Air photography was carried out for the following branches:—

Topographical Survey.

Forest Service.

Water Power and Reclamation Service.

National Parks Branch.

N.W.T. and Yukon Branch.

Department of Marine and Fisheries.—Air patrols for the investigation of ice conditions in Hudson strait.

Department of Railways and Canals.—Patrols for observation of formation and movement of ice on the west coast of Hudson bay.

Transportation to Churchill from end of steel on Hudson Bay Railway.

Department of Agriculture.—Air dusting of growing wheat for the prevention of wheat rust.

Air dusting of forest for the prevention of spruce budworm and hemlock luper.

Exposing of spore traps for determining the spread of wheat rust and the white pine blister rust.

Department of Indian Affairs.—Transportation of treaty paying parties.

Post Office Department.—Investigations and survey flights over proposed air mail routes.

Department of Mines.—Transportation and photography.

Department of Public Works.—Photography.

The units under the control of the Directorate of Civil Government Air Operations, during 1928 were:—

(a) *Headquarters, Ottawa, Ont.*

(b) *High River Air Station (High River, Alta.)*, with temporary landing and refuelling facilities at Rocky Mountain House and Pincher Creek, for the patrol of the forest reserves on the eastern slopes of the Rocky mountains; and a sub-base at Grande Prairie, for the patrol of forests in the Peace River district. No. 1 Photographic Detachment working in the province of British Columbia, was detached from this Air Station.

(c) *Winnipeg Air Station (Winnipeg, Man.)* with sub-stations at Lac du Bonnet, Man., Norway House, Man., Cormorant Lake, Man., Ladder Lake, Sask., and detachments at Winnipegosis, Man., and Ile-a-la-crosse, Sask., for the patrol of the forest areas surrounding Lake Winnipeg and between the Churchill and Saskatchewan rivers in northern Saskatchewan. Nos. 2, 3 and 4 Photographic Detachments were detached from this base.

(d) *Ottawa Air Station (Ottawa, Ont.)*.—Test for experimental work in the development of new equipment of methods. Attached to this station were all experimental air mail and other flights required for civil operations in Ontario and Quebec. Nos. 5, 6 and 7 Photographic Detachments were detached from this base.

(e) *Dartmouth Air Station (Dartmouth, N.S.)*.—A nucleus of personnel was maintained at this base to assist aircraft operating on air photography and other Civil Government operations in the Maritime Provinces. No. 8 Photographic Detachment was detached from this base.

(f) *Photographic Detachments*.—Eight self-contained photographic detachments were engaged in air photography in various parts of the country. They were controlled by Headquarters, Ottawa, but were attached to the nearest station for stores and accounting purposes.

(g) *Hudson Strait Expedition*.—From air bases at Nottingham Island, Wakeham Bay, and Port Burwell, patrols observed and reported on the navigability of the Strait, the movements of ice, and other conditions.

(h) *No. 1 Depot (Ottawa, Ont.)*.—The central storekeeping organization and workshop for the repair and maintenance of aircraft, engines and equipment for the Directorate of Civil Government Air Operations and the Royal Canadian Air Force.

(i) *Photographic Section (Ottawa, Ont.)*.—For the development of all air photographs taken by the Photographic Detachments and for production of prints and enlargements of the photographs required by the Topographical Survey and other Services requiring them.

Flying Operations

In order that flying operations may be successful, advance preparation is essential. Pilots and mechanics must be trained, suitable aircraft procured and supplies of gasoline and oil arranged, in the areas of operation. To allow time for preparation, Departments were requested in the fall of 1927, to outline their requirements for 1928. In consequence, an extensive program was prepared and provision made for the funds necessary to give effect to it. Additional requests were received during the year but it was not always possible to give effect to them without prejudice to the program to which the Department was already committed.

Air Photography

Extensive experiments carried out from 1922 to 1925, by the Topographical Survey, Department of the Interior, in co-operation with the Air Service, Department of National Defence, in various parts of Canada, resulted in the rapid development of methods for the practical application of air photography to the mapping of forested and mineralized areas, to the revision of old maps, to the preparation of base maps and the supplying of photographs for forestry, geological, water-power, and other investigations connected with the development of the country's natural resources. Under *Order in Council P.C. 180*, the Topographical Survey, Department of the Interior, was made responsible for the co-ordination of all air photographic operations and the office work connected therewith, and the study of the practical application of air photography in Canada. This it was felt, would result in the more speedy development of the science and greater economy in operation by preventing overlapping and duplication of work, and by avoiding the formation of staffs for air photography in various services. This organization acts in an advisory and consulting capacity, receives all requests for air photography from other services, issues the necessary technical instructions for operations, and is responsible for the central indexing, filing and plotting of the photographs. In this central office are available, for

the use of all, the photographs taken for every branch of the service. The necessity for this is self-evident. A photograph, taken during the investigation of the waterpower possibilities of a river, may be invaluable in map revision. It may at the same time, show clearly the nature of the forest cover, and, therefore, be of value to the forest services, either Dominion or Provincial; or, it may be that the geological features in the picture may be of the greatest interest to the Department of Mines. See Appendix "C," page 94.

The aircraft used in connection with civil government operations during 1928 were as follows:—

Type	Classification	Engine	Duties	Capacity
D. H. Moth.....	Landplane or seaplane...	80 H.P. Cirrus.....	Forest fire detection.....	Pilot and 1 passenger or radio.
Vickers "Vedette"...	Boat seaplane.....	200 H.P. Lynx.....	(a) Forest fire detection...	Pilot, 2 passengers and radio
			(b) Forest fire suppression.	Pilot and 2 passengers.
			(c) Photography at 8,000 feet.	Pilot and camera operator.
Vickers "Varuna"....	Boat seaplane.....	2-200 H.P. Lynx....	Forest fire suppression...	Pilot and 6 passengers.
Vickers "Viking"....	Boat seaplane.....	365 H.P. Eagle....	Photography at 5,000 feet	Pilot and camera operator.
Fairchild F.C. 2.....	Landplane or seaplane..	200 H.P. Whirlwind	(a) Photography at 9,000 feet.	Pilot and camera operator.
			(b) Air mail investigation.	Pilot and 4 passengers.
Fairchild F.C. 2W....	Landplane or seaplane..	425 H.P. Wasp.....	Photography at 16,000 feet	Pilot, camera operator and navigator.
Keystone Puffer.....	Landplane or seaplane..	200 H.P. Whirlwind	Forest and wheat dusting.	Pilot and 400 pounds of dust.

HIGH RIVER AIR STATION

High River Air Station was active from March 17, 1928, to December 3, 1928, during which period flying to the amount of 807 hours 52 minutes was carried out.

The establishments of the Unit were:—

Personnel— 4 Officers.

19 Airmen.

Aircraft — 6 D.H. "Moth" landplanes.

OPERATIONS FOR THE FOREST SERVICE

The patrol of the Bow river, Crowsnest and Clearwater forest reserves (comprising about 3,260,826 acres of forest land) which has been carried out since 1920 was continued. Aircraft on this duty were based at High River but made use of temporary landing and refuelling facilities at Rocky Mountain House and Pincher Creek.

The patrol aircraft were fitted with radio transmitters and in conjunction with the Royal Canadian Corps of Signals, reliable voice communication was maintained from aircraft in flight to the base, up to a distance of 200 miles. The Air Station is linked with the ground telephone system of the Forest Service which connects all ranger stations with their Headquarters in Calgary, so that radio messages from aircraft, reporting fires, were relayed by telephone to the nearest ranger station, without delay.

During the year an experimental service was started for the protection of the large area of forest land in the Peace River District. Aircraft on this duty operated from a temporary base at Grande Prairie.

During the season one (1) fire was observed and reported in Clearwater, Bow River and Crowsnest reserves and seven (7) fires in the Peace River District.

CIVIL OPERATIONS

A total of 22 hours 30 minutes flying was done in connection with civil aviation, which included the testing of Moth aircraft prior to delivery to flying clubs, attending the official openings of the Edmonton and the Calgary Aero Clubs, and inspection of air harbours, and aircraft.

MISCELLANEOUS OPERATIONS

A total of 32 hours 10 minutes flying was carried out in connection with miscellaneous operations, including parachute demonstrations and practice.

SUMMARY OF OPERATIONS

The flying for the year was as follows:—

	Hours	Minutes
Forestry.....	706	32
Civil aviation inspections, etc.....	22	30
Training.....	40	40
Miscellaneous.....	32	10
Total.....	<u>801</u>	<u>52</u>

WINNIPEG AIR STATION

The activities of this station were considerably increased during 1928. New aircraft were provided, and bases improved by the addition of better buildings, slipways, hangars, repair shops, and store houses. The operations during the season were carried out successfully.

During the season of 1928, aircraft were used for the following purposes:—

Fire protection patrols.

Suppression action on fires located.

Air photography for surveys.

Forest sketching.

Transportation of Indian Department Officials.

Obtaining information regarding the distribution of wheat rust spores.

Dusting growing wheat to prevent rust.

Transportation and reconnaissance flights for various Government officials or urgent work.

The establishment of aircraft and their distribution for the past season was as shown hereunder:—

—	Varuna	Vedette	Moth	Viking	Fairchild	Key-stone Puffer	Total
Lac du Bonnet.....	1	1	1				3
Norway House.....	1	1	1				3
Cormorant Lake.....	1	1	1				3
Ladder Lake.....	1	1	1				3
Winnipegosis.....		1					1
Ile-a-la-Crosse.....		1					1
General Purpose Flight.....				1		1	2
Fort Churchill Detachment.....					2		2
Reserve.....		2	3	1	2		8
Total.....	4	8	7	2	4	1	26

The establishment of personnel consisted of 25 officers and 72 airmen.

Organization of this station for 1928 was as follows:—

(a) Headquarters, with Stores and Workshops at Winnipeg.

(b) Lac du Bonnet, Sub-Station, Lac du Bonnet, Man.

(c) Norway House Sub-Station, Norway House, Man.

- (d) Cormorant Lake Sub-Station, Mile 42 H.B. Rly., Man.
- (e) Ladder Lake Sub-Station, Big River, Sask.
- (f) Winnipegosis Detachment, Winnipeg, Man.
- (g) Ile-a-la-Crosse Detachment, Isle-a-la-Crosse, Sask.
- (h) Fort Churchill Detachment.
- (i) Wheatdusting Detachment.

All bases were equipped with radio which provided adequate means of communication between the Units and Headquarters at Winnipeg.

The total flying time of this station was 3,522 hours 00 minutes.

OPERATIONS FOR THE FOREST SERVICE

Lac du Bonnet Sub-Station, situated about 70 miles northeast of Winnipeg, was the sub-station for all aircraft operations over the forest areas lying between Lake Winnipeg and the Manitoba boundary as far north as Berens River. The total flying time at this sub-station was 623 hours 40 minutes.

Norway House Sub-station, located on Forestry island in an expansion of the Nelson river, about 35 miles from lake Winnipeg, was the sub-station for aircraft operating over the forest area bounded on the north by the Hudson's Bay railway, on the west by a line drawn east and west through Berens river and on the east by a prolongation of the south end of the Manitoba-Ontario boundary. The total flying time at this sub-station was 444 hours 55 minutes.

Cormorant Lake Sub-station, located in the Narrows, between Cormorant lake and Little Cormorant lake at Mile 42 on the Hudson Bay railway, was the sub-station for aircraft operating over the forest areas bounded on the north by an east and west line through Cedar lake, on the east by a north and south line through Grand rapids and on the west by a north and south line through Dechameau lake. The total flying time at this sub-station was 795 hours 20 minutes.

Ladder Lake sub-station, located on the lake of that name, about one mile east of Big River and 100 miles northwest of Prince Albert, was the sub-station for aircraft operating over the forest areas bounded on the north by the Churchill river, on the west by a north and south line, through Primrose lake, on the south by an east and west line drawn through Ladder lake, and on the east by a north and south line through the east end of lac la Ronge. The total flying time at this sub-station was 627 hours 50 minutes.

Winnipegosis Detachment was stationed on Snake island in lake Winnipegosis, about 5 miles east of the settlement of Winnipegosis. The detachment patrolled the forest areas around lake Winnipegosis and as far east as lake St. Martin. The total flying time of this detachment was 87 hours 05 minutes.

The Ile-à-la-Crosse Detachment was formed to patrol the Ile-à-la-Crosse district, which in previous years had been covered inadequately by aircraft operating from Ladder lake. It was found that fires in this area became so menacing to the forests as to justify the establishing of a detachment in the district to cope with the situation. The settlement of Ile-a-la-Crosse, situated on the west shore of lake Ile-à-la-Crosse, was selected as a base from which to operate. The total flying time of this detachment was 193 hours, 25 minutes.

During the fire-hazard season, 179 fires were detected, and suppression action taken as required. The flying time on forest protection was 2,507 hours, 05 minutes. A total of 567 flights were made, and approximately 162,955 miles were flown. The fire hazard was high all summer, the season being the worst experienced since the introduction of air patrols.

The total area of forest patrolled by aircraft was approximately 61,273,737 acres.

DEPARTMENT OF RAILWAYS AND CANALS

Fort Churchill Detachment.—This detachment was formed primarily for the Department of Railways and Canals, to transport their personnel into Churchill; also to make coastal ice patrols on the west coast of Hudson bay, between Nelson and Churchill. A temporary base was established at Deer Lake, which is situated at Mile 437 on the Hudson Bay railway. The lake is approximately three-quarters of a mile wide by one and one-quarter miles long. Two Fairchild aircraft were used by this detachment. The personnel consisted of 2 officers and 7 airmen. The total flying time was 538 hours.

DEPARTMENT OF AGRICULTURE

The Wheat Dusting Detachment, consisting of one Keystone Puffer aircraft, was used for the purpose of carrying out experiments for the Department of Agriculture, by dusting wheat areas in Manitoba, infected by black stem rust, with chemicals. See Appendix "D," page 97, for detailed account of wheat dusting experiments.

The personnel consisted of 1 officer and 2 airmen. The total flying time for wheat dusting experiments was 40 hours, 20 minutes.

TRANSPORTATION

In addition to the main operations for the Forest Service and Topographical Survey, transportation was supplied to the Department of Railways and Canals, Department of Mines, Department of Indian Affairs, Water Power and Reclamation Service, and the Royal Canadian Mounted Police.

SUMMARY OF OPERATIONS

The flying for the year was as follows:—

	Hours	Minutes
Forestry.....	2,507	05
Transportation of supplies to photographic detachments.....	366	45
Photography, railways and canals transportation and reconnaissance..	538	00
Miscellaneous.....	110	10
Total.....	<u>3,522</u>	<u>00</u>

OTTAWA AIR STATION

The base at Shirley's Bay for summer operations, was active from April 10 to December 9. The establishment of personnel consisted of 12 officers and 45 airmen. The aircraft used were: 3 Vedettes, 1 Varuna, 1 Vista, 3 Fairchild F.C. 2's, 3 D.H. 60X Moths, 1 Keystone Puffer, and 1 Douglas seaplane. A total of 1,367 hours, 36 minutes flying time was carried out by this unit during the season.

Air Photography

The majority of the air photography for the Topographical Survey was undertaken by photographic detachments, but several photographic operations in the vicinity of Ottawa were undertaken by this station. These were more in the nature of training for personnel who had only a limited experience in air photography. As this training progressed, several small operations were carried out successfully. Altogether, about 1,000 square miles of vertical, and 200 miles of oblique photography were done from this Station. Twenty-two rolls of film were exposed.

TRANSPORTATION, PRACTICE AND INSTRUCTIONAL FLYING

Flying was carried out for the purpose of transporting officials of the Civil Aviation Branch on inspection duty, etc. A considerable amount of training flying was done, which included seaplane flying for officers with no seaplane experience, and dual instruction.

TEST AND EXPERIMENTAL FLYING

The test flight of this station carried out a number of type tests and trials of aircraft, instruments, wireless, aero cameras, and photographic film.

DUSTING OPERATIONS

Dusting operations in Eastern Canada were carried out under the direct supervision of the Officer in Charge of Forest Insect Investigation, Department of Agriculture. Experimental air dusting for the prevention of spruce budworm was in the vicinity of Westree, Ont. A Keystone Puffer, with pilot and **mechanic**, was detailed for this operation, and a series of dusting flights were carried out as desired.

AIR ROUTE INVESTIGATIONS

Flights, investigating the feasibility of different air routes in Canada, were carried out by the personnel of this unit during the year. This work was done under the direction of the Controller of Civil Aviation, and his representative was carried on these flights. The first patrol of this nature was completed in a seaplane, west from Ottawa along the water route to Minaki, Ont., the return journey being made over an entirely different route in order that different portions of the country could be surveyed, and alternative routes reported upon.

A second flight, east from Ottawa to Halifax, was undertaken for the same purpose, all air harbours and possible air routes along the way being investigated and surveyed. Considerable valuable data was secured from these flights.

A series of flights were carried out between Montreal and Toronto for the purpose of investigating the route between these two cities in connection with the carrying of air mail. Nine return trips were flown in two periods of ten days each, on this duty, and the necessary information obtained.

Another series of flights were undertaken for the same purpose between the cities of Toronto and Buffalo. Six return trips were flown between these points.

CIVILIAN AIRCRAFT

During the past season a large number of civilian aircraft stopped at Shirley's Bay en route to their respective bases. In all cases every possible assistance was rendered them and their needs satisfied as far as possible.

SUMMARY OF OPERATIONS

The flying for the year was as follows:—

	Hours	Minutes
Oblique and vertical photography.....	139	01
Dusting.....	33	03
Transportation.....	256	22
Practice and instruction.....	479	50
Air mail investigation.....	234	01
Air route investigation.....	76	20
Test flying, type tests, etc.....	104	09
Experimental tests (wireless).....	44	50
Total.....	<u>1,367</u>	<u>36</u>

No. 1 PHOTOGRAPHIC DETACHMENT

No. 1 Photographic Detachment carried out oblique and vertical photography in British Columbia. Two Fairchild F.C.2.W. aircraft were operated. The total flying time was 211 hours 05 minutes. The personnel of the detachment consisted of 2 officers, 4 airmen and 1 navigator, from the Topographical Survey. One oblique and 5 vertical photographic operations were allotted

to this detachment during the season. A customs patrol was carried out for the Department of National Revenue. The details of these operations are as follows:—

(a) Oblique photography in the vicinity of Victoria and Esquimalt, for the Department of Public Works; 299 photographs were taken. The flying time was 8 hours 25 minutes.

(b) Vertical photography at Squamish, for the Topographical Survey. Ten photographs were taken. The flying time was 1 hour.

(c) Vertical photography at Mud Bay; 178 photographs were taken. The flying time was 3 hours 20 minutes.

(d) Vertical photography in the vicinity of Sicamous, for the Topographical Survey; 5,819 photographs were taken. The flying time was 95 hours 10 minutes.

(e) Vertical photography along the Fraser and Thompson rivers; 2,411 photographs were taken. The flying time was 38 hours 30 minutes.

(f) Vertical photography in the Fraser Lake district; 3,570 photographs were taken. The flying time was 60 hours 40 minutes.

(g) Customs patrols along the coast of British Columbia, for the Department of National Revenue. The flying time was 4 hours.

No. 2 PHOTOGRAPHIC DETACHMENT

No. 2 Photographic Detachment carried out vertical photography in northern Manitoba, eastern Manitoba, and northern Ontario. Two Fairchild F.C.2. aircraft were operated. The total flying time was 400 hours 13 minutes. The personnel of the detachment consisted of 2 officers, 4 airmen and 1 navigator from the Topographical Survey. Ten vertical photographic operations were allotted to this Detachment throughout the year, and, with the exception of the Flin Flon area, completed by the end of the season. A number of flights were also carried out for the Topographical Survey to establish communication between widely separated survey parties and also to check the levels between an isolated group of lakes. The details of these operations are as follows:—

(a) Vertical photography over the Long Lake area of the Central Manitoba Mining District for the use of the Department of Mines Geological Survey; 116 miles of photography were completed, and three rolls of film exposed. Weather conditions were good. Flying time was 16 hours 40 minutes.

(b) Vertical photography over the Lac Seul flood area. Fifty-three rolls of film were exposed on this operation, covering 2,324 photo. miles for a flying time of 200 hours 43 minutes.

(c) Vertical photography over Lac Seul, comprising two blocks, one south of the town of Hudson for the purpose of checking the geological formation, and the second block south of Gold Pines for the purpose of checking an alternative power site. Six rolls of film were used, covering 100 photo. miles. Weather conditions were fair. Flying time was 11 hours 10 minutes.

(d) Vertical photography over the height of land between lake St. Joseph and the headwaters of the Root river. The operation was completed in one flight from the Sioux Lookout base. One roll of film was used covering 30 miles of photography. Flying time was 1 hour 45 minutes.

(e) Vertical photography over part of the Patricia Mining Area north of Sioux Lookout. The work was divided into two blocks: Block "A" to be flown at 5,000 feet, and Block "B" at 7,000 feet. Photo. miles 50, rolls of film 3, flying time 16 hours 50 minutes.

(f) Vertical photography over a series of power sites on the Nelson river, running north from Playgreen lake, to Sipiwesk lake. Good weather conditions prevailed. Photo. miles flown 1,050, rolls of film exposed 24. Flying time was 79 hours 45 minutes.

(g) Vertical photography over the boat channel from Warren's Landing to Norway House from an altitude of 7,000 feet, one roll of film being used for 25 photo. miles and was carried out in conjunction with other operations.

(h) Vertical photography over the mining area north of Cormorant Lake, and extended from Goose lake in the south to Lake Kississing in the north; 609 of the 1,980 photographic miles were completed, and 11 rolls of film were exposed. Flying time was 35 hours 45 minutes.

(i) Vertical photography over the proposed branch lines from lake Athapapuskow north to the Sherritt-Gordon Mines at an elevation of 7,000 feet. Two rolls of film were exposed for 40 miles of photography. The flying time was 3 hours 45 minutes.

(j) Vertical photography over an area from Kenora to White Dog falls, following the course of the Winnipeg river and was for the purpose of checking flood areas and correcting existing maps. Photo. miles 420, rolls of film exposed 9, flying time 33 hours, 50 minutes.

No. 3 PHOTOGRAPHIC DETACHMENT

No. 3 Photographic Detachment carried out oblique and vertical photography in western Ontario, northern Saskatchewan, and Manitoba. Two Vickers Vedette flying boats were operated. The total flying time was 327 hours, 45 minutes. The personnel of the Detachment consisted of 2 officers, 4 airmen and 1 navigator from the Topographical Survey. Four operations were attempted by this detachment, consisting of three obliques and one vertical, in Ontario, Manitoba and Saskatchewan, the vertical work being in Manitoba. The details of these operations are as follows:—

(a) Oblique photography of the Rainy river and Quetico areas. Twenty rolls of film were exposed over 1,025 photographic miles. Fair weather was experienced. Flying time was 85 hours, 25 minutes.

(b) Oblique photography from 5,000 feet of the area adjacent to the Churchill river, with Pelican narrows and lac la Ronge being the centre points to work from for each sheet. Sixty-seven rolls of film were exposed over 3,465 photographic miles. Flying time was 147 hours, 10 minutes.

(c) Oblique photography of the area around the southern half of Reindeer lake, Sask., at 5,000 feet. Fourteen rolls of film were exposed over 660 photographic miles. The flying time was 32 hours, 05 minutes.

(d) Vertical photography of the various falls in the vicinity of Pukatawagan on the Churchill river, together with some oblique work to the south of Churchill, and northwest of the Burntwood river. Eighteen rolls of film were exposed over 750 photographic miles, oblique and vertical included. The flying time was 63 hours, 05 minutes.

No. 4 PHOTOGRAPHIC DETACHMENT

No. 4 Photographic Detachment carried out oblique photographic operations in western Ontario, northern Alberta, northern Saskatchewan, and northern and central Manitoba. Two Vickers Viking amphibian flying boats were operated. The total flying time was 359 hours, 40 minutes. The personnel consisted of 2 officers, 5 airmen, and 1 navigator from the Topographical Survey. Five Operations were attempted during the season, four of which were com-

pleted, and the fifth partially completed, while a reconnaissance flight for a sixth operation was carried out, but no photography taken. The details of these operations are as follows:—

(a) Oblique photography in the Rainy river and Quetico areas was carried out by No. 3 and 4 Photographic Detachments working in conjunction. Exceptionally bad weather prevailed while attempting this operation, and the detachment was ordered to proceed to northern Alberta on July 21, leaving this operation uncompleted. The detachment again returned to this operation at the end of the season after completion of operations in northern Alberta, and eastern Manitoba, but no photographic weather was experienced. Thirty-two rolls of film were exposed over 1,572 photographic miles. Flying time was 133 hours, 40 minutes.

(b) The area covered was the territory bounded by the Slave river on the west, lake Athabaska on the east, and on the north by the northern boundary of Alberta. Twenty-three film rolls were exposed over 988 photographic miles. The flying time was 120 hours, 10 minutes.

(c) Oblique photography of an area in the Buffalo Park Reserve, extending from Buffalo river and Buffalo lake southeast to within a distance of about 50 miles west of Fort Fitzgerald. The whole territory, for a distance of about 45 miles west of the Slave river, from Fort Fitzgerald north, appeared to contain no landing places. It was considered that to photograph this area would involve undue risk to personnel, and the operation was cancelled by the Topographical Survey. No photography was done. The flying time was 4 hours, 20 minutes.

(d) Oblique photography at 2,000 feet altitude, of the Clearwater river from Fort McMurray, a distance of approximately 70 miles southwest. Four rolls of film were exposed over 165 photographic miles. Flying time was 7 hours, 25 minutes.

(e) Oblique photography from 5,000 feet altitude of the Manitoba-Ontario boundary from Island Lake southwest, a distance of about 90 miles, and to be photographed in both directions.

(f) Oblique photography of the Manitoba-Ontario boundary in the vicinity of Sandy Lake in western Ontario. Eight rolls of film were exposed over 520 photographic miles. The flying time was 67 hours, 25 minutes.

(g) Oblique photography of the Manitoba-Ontario boundary in the vicinity of Deer Lake and Sandy lake in western Canada. Ten rolls of film were exposed over 519 photographic miles. The flying time was 26 hours, 40 minutes.

No. 5 PHOTOGRAPHIC DETACHMENT

No. 5 Photographic Detachment carried out vertical and oblique photography in eastern Ontario and Quebec. Two Vedette aircraft were operated. The total flying time was 325 hours, 50 minutes. The personnel of the detachment consisted of 2 officers, 6 airmen, and 1 navigator from the Topographical Survey. Three photographic operations were carried out by this Detachment, and completed by the end of the season. The details of these operations are as follows:—

(a) Vertical photography for mapping purposes, taken from an altitude of 1,000 feet, of an area embracing 1,900 square miles, situated as follows: an area north of the Ottawa river, bounded on the east by the Gatineau river, on the west by the Ottawa river, and extending from Chalk Bay to Squaw lake at the northern limits. Twenty-seven rolls of film were exposed over 1,592 photographic miles. The flying time was 85 hours, 20 minutes.

(b) A special operation was carried out for the Department of Public Works. This operation entailed the taking of vertical and oblique photography

of the Gatineau Company's property areas in the city of Ottawa. The vertical photography was taken from an altitude of 1,500 feet. Two rolls of film were exposed. The flying time was 2 hours, 15 minutes.

(c) Vertical photography taken at a constant altitude above sea level, of approximately 3,500 square miles of territory, for mapping and investigation purposes, for the Topographical Survey. This operation was divided between No. 5 and 7 Detachments. The base was at Lac Archambault. The area was bounded on the south by a line joining Cypress lake and the Mastigouche river, and on the north by a line from the south end of Mondanak lake and the Vermilion river; 2,256 photographic miles were flown, and 47 rolls of film exposed. The flying time was 228 hours 35 minutes.

(d) Vertical photography in the vicinity of lake St. John, P.Q. The flying time was 9 hours, 40 minutes.

No. 6 PHOTOGRAPHIC DETACHMENT

No. 6 Photographic Detachment carried out vertical and oblique photography in central and eastern Ontario, and Western Quebec. Two Fairchild aircraft were operated. The total flying time was 367 hours, 15 minutes. The personnel of the detachment consisted of 2 officers, 4 airmen and 1 navigator from the Topographical Survey. Eight vertical operations and one oblique photographic operation, and one operation in connection with instruction practice and transportation, were carried out. The details of these operations are as follows:—

(a) Vertical photography in the vicinity of Sudbury, Ont., for the Topographical Survey; 3,816 photographs were taken. The flying time was 102 hours, 15 minutes.

(b) Vertical photography in the vicinity of Hull, P.Q.; 227 photographs were taken. The flying time was 4 hours, 10 minutes.

(c) Oblique photography of the Dominion Observatory; 49 photographs were taken. The flying time was 1 hour, 05 minutes.

(d) Vertical photography for map sheet G.31 G./N.W.; 812 photographs were taken. The flying time was 48 hours, 30 minutes.

(e) Vertical photography for map sheet 31 F./N.E.; 74 photographs were taken. The total flying time was 6 hours, 55 minutes.

(f) Vertical photography in the district of Valleyfield; 132 photographs were taken. The flying time was 4 hours, 15 minutes.

(g) Vertical photography over the cities of Ottawa and Hull; 656 photographs were taken. The flying time was 7 hours, 30 minutes.

(h) Instruction, practice and transportation for the Air Service of the Department of National Defence. The flying time was 6 hours, 10 minutes.

(i) Vertical photography in the district of Lake Nipissing. Three thousand five hundred photographs were taken. The flying time was 108 hours.

(j) Vertical photography in the area of Rouyn; 1,800 photographs were taken. The flying time was 78 hours 25 minutes.

No. 7 PHOTOGRAPHIC DETACHMENT

No. 7 Photographic Detachment carried out vertical photography in eastern Quebec. They operated 2 Fairchild aircraft. The total flying time was 441 hours 08 minutes. The personnel of the detachment consisted of 2 officers, 3 airmen and 1 navigator, from the Topographical Survey. Seven photographic operations were carried out by this detachment and completed by the end of the season. The details of these operations are as follows:—

(a) Vertical photography over an area from the Ottawa river down to the island of Montreal; 1,853 photographs were taken. The flying time was 70 hours 50 minutes.

(b) Vertical photography over an area adjoining T.S.61, north of Ottawa; 207 photographs were taken. The flying time was 8 hours 30 minutes.

(c) Vertical photography of map sheet 31.F/N.E.; 1,010 photographs were taken. The flying time was 27 hours 25 minutes.

(d) Vertical photography of map sheet 31.J.13. K/9, K/6; 1,212 photographs were taken. The flying time was 32 hours 40 minutes.

(e) Vertical photography covering an area over the headwaters of the Gatineau, Rouge and Mattawin rivers; 9,746 photographs were taken. The flying time was 267 hours 18 minutes.

(f) Vertical photography near lake Batiscan, east of the St. Maurice river, and was a gap operation; 1,170 photographs were taken. The flying time was 24 hours 55 minutes.

(g) Vertical photography of the north of Ottawa; 332 photographs were taken. The flying time was 9 hours 30 minutes.

Special flights on oblique photography were also carried out. One along the Flamand river and the St. Maurice river, between Windigo and Cressmann, both banks of the river being photographed from an altitude of 2,000 feet. The other to lac Clare, 35 miles north of St. Michel des Saints, for the purpose of carrying out a ground reconnaissance, and running level lines in certain areas.

No. 8 PHOTOGRAPHIC DETACHMENT

No. 8 Photographic Detachment carried out vertical photography in the Maritime Provinces. Two Fairchild aircraft were operated. The total flying time was 326 hours 25 minutes. The personnel of the detachment consisted of 3 officers and 4 airmen. Nine photographic operations were carried out by this detachment, the details of which are as follows:—

(a) Vertical photography at Shelburne, N.S., and was successfully completed; 760 photographs were taken. The flying time was 25 hours 55 minutes.

(b) Vertical photography of Map Sheet 21 A./S.W. and 21 B./S.E.; 2,814 photographs were taken. The flying time was 96 hours 50 minutes.

(c) Vertical photography along the Petitecodiac river, in the vicinity of the Bay of Fundy; 284 photographs were taken. The flying time was 27 hours 05 minutes.

(d) Vertical photography over St. John, N.B.; 83 photographs were taken. The flying time was 37 hours 55 minutes.

(e) Vertical photography in Cape Breton. This operation included carrying sketches from Oxford Pulp and Paper Co., and was carried out to their satisfaction; 316 photographs were taken. The flying time was 41 hours 20 minutes.

(f) Vertical photography of map sheet 21 I/S.W.; 1,043 photographs were taken. The flying time was 47 hours 45 minutes.

(g) Transportation flights were carried out. The flying time was 12 hours 05 minutes.

(h) Vertical photography of the l'Orignal area. The flying time was 24 hours 30 minutes.

PHOTOGRAPHIC SECTION

The Photographic Section, which is situated on the eighth floor of the Jackson Building, Ottawa, is equipped for the developing, printing, enlarging, etc., of all air photographs taken by the Air Services.

During 1928 a total of 1,002 rolls of aero film were developed as compared to 645 rolls in 1927. Printing increased correspondingly, the total production for the season being as follows: 90,000 8-inch by 10-inch prints, and 90,000 9-inch by 11-inch prints which were supplied to the Topographical Survey for indexing and mapping purposes; 18,000 miscellaneous prints supplied to commercial concerns and individuals; and a large number of lantern slides, copies, enlargements, etc.

The establishment of the Photographic Section consisted of 2 officers and 11 trained and 7 untrained men. In addition, 7 civilian labourers were employed for the busy season only.

During the operational season films which were sent in to the Photographic Section for development were checked over for defects, camera trouble, drift, overlap, etc., after development, and a detailed report was forwarded to the officers in charge of photographic detachments, giving them all details and advice on how to overcome such defects. By this system of checking, mistakes were rectified immediately and the work in the field kept up to a high standard of efficiency.

A certain amount of motion picture work was also undertaken by the photographic section. Various films were taken in connection with air mail services, winter activities, forestry operations, wheat dusting, etc., and prints of these made available for educational and publicity purposes.

HUDSON STRAIT EXPEDITION, 1927-28

OBJECT OF EXPEDITION

In January, 1927, a decision was reached by the Government to complete the Hudson Bay railway and terminals, and to send an expedition to Hudson strait. The expedition was under the direction of the Department of Marine. Transportation to the bases, erection of the buildings, etc., was carried out under their supervision and direction.

The object of the expedition was to:—

- (a) Procure by means of air photography and reconnaissance, definite information for the establishment of an absolute time limit for Marine Navigation through the Hudson strait.
- (b) Test the feasibility of use of aircraft as an aid to navigation through the Hudson strait.
- (c) Test the suitability of air bases, aeronautical equipment and other equipment necessary to air operations with a view to establishing air operational bases in the Hudson strait.

The information obtained concerning navigation conditions was gathered for the use of the Department of Marine.

ADVISORY BOARD

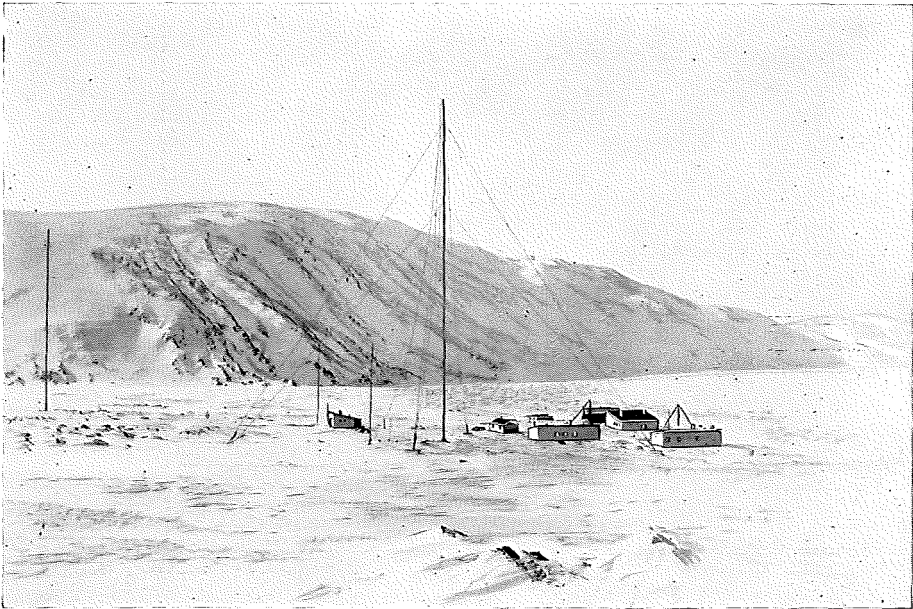
An Order in Council, P.C. 83, dated January 22, 1927, provided for an Advisory Board consisting of three members, one from each of the departments concerned, viz., Marine and Fisheries, National Defence, and Railways and Canals.

Regular meetings were held from February 4, 1927, until June 28, 1927, and this board was responsible for the organization of the expedition, up to the date of its departure from Halifax.

The board consisted of N. B. McLean, Esq., Officer in Charge of the expedition, Department of Marine and Fisheries, with E. B. Jost, Esq., C.E., Department of Railways and Canals. Group Captain J. L. Gordon, D.F.C., A.D.C., replaced Group Captain J. S. Scott, M.C., A.F.C., on July 1, 1927, and was responsible for the flying operations of the expedition.



DRIFT ICE, PORT BURWELL. June, 1928.



BASE "C," WAKEHAM BAY.

GENERAL PLAN OF OPERATIONS AND SUPPLIES

The general plan of operations as worked out by the Advisory Board, and approved by the Departments of Marine and Fisheries, Railways and Canals, and National Defence, made provision for three bases, one at the east end of the strait, one at the west end, and one half way between these two.

On February 11, authority was granted for the purchase of supplies, which were assembled at Halifax. A contract was made for twenty-one buildings comprising three officers' and three mens' dwellings, three radio houses, three storehouses, three blubber houses and six hangars. The materials were all cut and fitted ready to set up, and another contract was arranged for their erection at the different bases.

The equipment of the three bases was practically the same. Two "Fokker" aeroplanes complete with floats, skis and wheels for landing, and all necessary accessories, including spare engines, were allotted to each base, together with a 30-foot motor launch, one Fordson tractor, radio apparatus consisting of two gasoline engines to generate power, with two 150-foot steel masts, gasoline, oil, coal, stoves, bedding, one skiff, guns, rifles and ammunition and provisions for a period of sixteen months. No essential was omitted. A "Moth" seaplane was carried, in assembled condition, on the after deck of the *Stanley* to assist in locating the bases.

TRANSPORTATION

For transporting the men and equipment to Hudson strait, the C.G.S. *Stanley*, an ice-breaker, and the ss. *Larch*, a freighter, were commissioned. The *Stanley* took the passengers and the *Larch* carried 2,700 tons of coal, as well as 2,585 tons of general cargo.

On July 17, 1927, the *Stanley* sailed from Halifax with the members of the expedition consisting of 44 all ranks. The *Larch* carried a construction crew of 57.

ORGANIZATION

The Department of Marine and Fisheries provided for personnel comprising doctors, wireless engineers and operators (for ground communications only), storekeepers and cooks.

The Royal Canadian Corps of Signals were responsible for the wireless communications, equipment for installation in aircraft and ground apparatus for the reception of air to ground signals, and provided one officer and three other ranks for this purpose.

The Royal Canadian Air Force received the major portion of responsibilities in the organization of the expedition, and provided six officers and twelve airmen.

The Royal Canadian Mounted Police detailed one member for duty at each base.

LOCATION AND ESTABLISHMENT OF BASES

Upon the arrival at Port Burwell, on July 27, 1927, the "Moth" seaplane was launched and flights carried out for the purpose of locating a base. The knowledge of the fact that the early fall ice makes its first appearance on the west entrance to the straits, it was desirable to establish bases in sequence from west to east. Accordingly, an investigation party was left to explore Port Burwell and vicinity, for the most suitable base location. The officer in charge of this base, a medical officer and two airmen, together with motor boat, supplies and equipment for two months, were left there to carry out the investigation, and the remainder of the expedition proceeded west towards Nottingham island.

On August 3, 1927, the "Moth" was launched, and an observation patrol flight, making a complete circuit of Nottingham Island, was carried out. The use of the "Moth" was invaluable for the purpose of locating the base, as it

would have taken the ship months of hazardous work to survey the shore line of this island. In consequence of this flight, a suitable site was located, which was well sheltered, and the best available in such a rugged country. Supplies were landed, and Base "B" was established at Nottingham island.

On August 18, the permanent personnel were left ashore, and both ships proceeded to Lake Harbour, Baffin Land, to carry out the establishment of Base "C". Extensive air patrols and ground reconnaissance expeditions were made during four days' stay at Lake Harbour, but as there was no beach of any kind in this locality, it was impossible to establish a base. The ships proceeded to Wakeham Bay where anchors were dropped on August 24, 1927.

A short flight in the "Moth" and a ground survey of the best location sighted from the air, enabled Base "C" to be established at Wakeham Bay.

Unloading operations at Wakeham Bay were completed by September 11, 1927, and the permanent personnel and construction crew for this base were left ashore and the ships proceeded to Port Burwell and established Base "A" at Port Burwell.

The construction crews were withdrawn from the bases and embarked on the C.G.S. *Stanley*, which proceeded south on November 11, leaving the permanent staff to finish the constructional work before the severe cold weather set in. By the end of November, 1927, all personnel, equipment and supplies were comfortably and safely housed.

OPERATIONS

A system of routine and special patrols for all three bases was drawn up and approved before actual flying commenced. During certain periods of the year routine patrols were carried out daily, from each base, weather permitting, and special patrols of aircraft from Wakeham Bay, Nottingham Island, and Port Burwell, rendezvoused in certain areas between their respective bases on the same day. This latter system was adopted to provide for the collection of information throughout the length of the strait within the same period of elapsed time. Special patrols were only carried out when considered essential. During the whole period the frequency of patrols was reduced on account of very bad weather and erratic air conditions.

Photographic operations were carried out using oblique hand-held cameras, and exposures made while flying a direct course at constant altitudes, using the same angle of deflection and allowing for a sixty per cent overlap. This method was adopted to permit of the interpretation of the nature of the ice by use of the stereoscope. Hydrographic survey charts on which a grid was superimposed were used and exposures pin-pointed as closely as possible.

On the completion of each patrol, pilots were required to complete a concise detailed report of the ice conditions as seen in the area covered by their patrol.

Wireless communication from air to ground was maintained by the use of the C.T.21 A transmitting set with trailing antennae. Both voice and key were available with remote control installed for the use of the pilot. Whilst on patrol, aircraft were required to communicate with their base every five minutes.

The initial operations of the expedition were the observation patrols carried out locating suitable base sites, using the "Moth" seaplanes. Much time was saved by the use of this aircraft, and satisfaction given in knowing that the bases were the best sites available near the tentative location to which instructions stated they were to be established.

Unfortunately the "Moth" was completely wrecked a few days after arriving at Wakeham Bay, although the work for which it had been supplied

was completed. It was taken off the *Stanley* and moored awaiting an opportunity to bring it ashore, when a heavy southwest gale suddenly sprang up and in a few minutes it became impossible to approach the aircraft at its mooring. The conditions were so severe that the *Stanley* and the *Larch* each had two anchors out, and were keeping their propellers turning over to keep from dragging. The "Moth" rode out through heavy seas for over twelve hours, when it turned turtle at the mooring. The seaworthiness of this light plane was demonstrated by riding such a storm as long as it did.

Operations using the "Fokker" seaplanes in the summer and fall of 1927 were not very extensive owing to bad weather and lack of time, the permanent personnel having too many duties other than flying, in the establishment of the bases before winter set in. Patrols were carried out, however, whenever possible. As the ice did not make its first appearance until November 16, 1927, in the vicinity of Nottingham island, there was no loss of information suffered through a limited amount of flying during the fall.

The patrols commenced at respective bases as follows:—

Port Burwell—October 23, 1927.

Nottingham Island—October 11, 1927.

Wakeham Bay—September 29, 1927.

Flying was done on pontoons until the first ice appeared in the straits.

At Port Burwell, from the commencement of flying patrols, until ice formed, a period of thirty-one days, the weather was very bad and accompanied almost continuously with high winds, snow and poor visibility. The between season, from pontoons to skis, lasted for nineteen days, during which time ice conditions, both along the shores and coves, were unsafe. Every tide undid the efforts of the personnel in the construction of a runway over the rough shore ice to the level ice, from the hangars, and entailed endless labour.

At Nottingham Island, from the first patrol until ice formed, a period of thirty-three days, generally bad weather existed. Flying was carried on whenever possible, and the first ice in the strait on November 16 was not missed. On the same date the cove froze over and flying on pontoons was abandoned. The between season period, from pontoons to skis, at Nottingham Island, only lasted for seven days, as the conditions were much colder than at the other bases.

Operations at Wakeham Bay, were carried on until the period of freeze-up in 1927. There was an interval of fifty-three days from the date of the first flight on pontoons until the freeze-up. Patrols were made on ten of those days. Weather conditions such as snow and fog, hindered flying on twenty-four. The other nineteen days, nearly all in November, high winds and heavy formations of shore ice, made it impossible to operate. The inter-season between pontoons and skis, at Wakeham Bay, was eighteen days.

During the winter and spring, 1927-28, consistent flying was carried on using skis, at the respective bases, the periods being as follows:—

Port Burwell—December 13, 1927, to May 22, 1928.

Nottingham Island—November 23, 1927, to May 30, 1928.

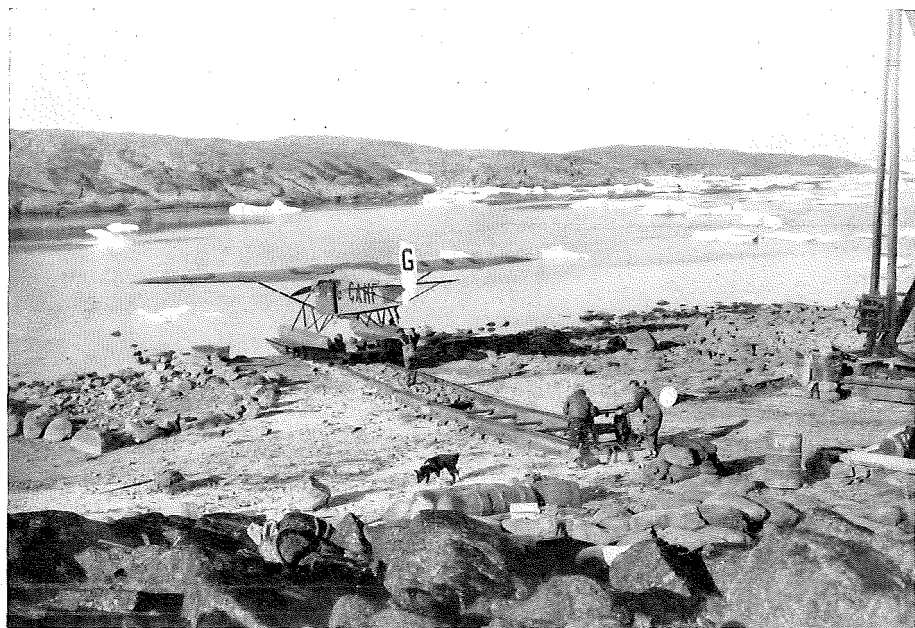
Wakeham Bay—December 12, 1927, to June 18, 1928.

Routine patrols were carried out whenever possible, up to January 25, 1928, when these were discontinued and fortnightly patrols carried out.

Very bad weather prevailed, especially at Port Burwell. Snow and fog were the worst conditions and for the greater part of the time, up to January 25, very low and limited visibility existed, with the hills in the vicinity of the bases being totally obscured for days. The fortnightly patrols from January 25 to May 12, 1928, were adhered to as closely as possible. On May 10, routine patrols were again established and from then on, up to the breakup,



DWELLING. BASE "A," PORT BURWELL.



LAUNCHING AIRCRAFT. BASE "B," NOTTINGHAM ISLAND.

flying was done on every possible day. The better weather conditions experienced, allowed a higher percentage of flying than any other period of the operation.

During the winter and spring flying on skis, there were three occasions upon which aircraft were lost or forced down by bad weather.

The first of these incidents happened when Flight-Lieutenant A. A. Leitch, M.C., D.F.C., was returning from Erik Cove, at Cape Wolstenholme, to Nottingham Island. About half-way across snowstorms were encountered, and a landing was made on an ice floe to await clearer weather. The following day he took off and arrived at the extreme northwest end of Nottingham Island. He arrived back at the base successfully. The temperature was 16 degrees below zero, and a few minor frost bites were experienced by the personnel.

The second incident occurred when Squadron Leader T. A. Lawrence was proceeding from Wakeham Bay to Nottingham Island, early in January. Heavy snowstorms were encountered twenty miles east of Cape Digges, and he proceeded to return and land at Sugluk Inlet, and await better conditions. The weather was extremely severe and the following day he decided to return to Wakeham Bay, but snowstorms forced him to land in Deception bay where the aircraft and crew remained for nine days, during which time typical Arctic storms prevailed. On the eighth day a search machine arrived from Wakeham Bay and the following day both machines returned to their base at Wakeham Bay.

The third and last incident, in which the aircraft had to be abandoned, was to Flying Officer A. Lewis, who with a mechanic and native, became lost in heavy snowstorms while on a patrol from Port Burwell during their return flight from Resolution Island. Owing to the petrol supply becoming exhausted, a forced landing was made on rough, hummocky floe ice. The crew were unhurt and the aircraft slightly damaged. The crew, carrying their emergency kits, travelled east across the ice, when, after a full days travel, it was realized that they were on floe ice in the Atlantic ocean, off the Labrador coast. It was at first thought they were in Ungava bay. When this was realized they turned and travelled westward for seven days, reaching the Labrador coast after much privation and hard travelling. Their food supply became exhausted and they were forced to live on raw walrus meat, shot by their native companion. Endless lanes of open water had to be crossed, and the ice conditions were very rough. The inflatable rubber air raft was used over the water crossings. The party reached land and travelled for four days along the Labrador Coast, which was totally barren of human or bird life. They suffered greatly from cold, hunger and exposure. On the fifth day they met an Eskimo hunter and his wife who provided food and transportation by dog team, back to Port Burwell, arriving after thirteen days' absence. During their absence, one machine from each base was engaged in search by air for their whereabouts. The period of their being lost was the coldest and stormiest part of the winter, and only three days' flying out of the thirteen was possible.

In the spring and summer of 1928 flying was continued. The interval between using skis and pontoons varied at the respective bases, and flying was impossible during the following periods:—

Port Burwell—May 23, 1928-July 1, 1928 (inc.).

Nottingham Island—May 31, 1928-July 1, 1928 (inc.).

Wakeham Bay—June 19, 1928-June 29, 1928 (inc.).

Flying was carried out from these latter dates until August 3, when navigation conditions rendered further air observations unnecessary, there being no ice in the strait.



INSPECTION OF KIT BEFORE CARRYING OUT PATROL.
BASE "C," WAKEHAM BAY



READY TO PROCEED TO PORT BURWELL TO ASSIST IN SEARCH OF MISSING AIRCRAFT.
BASE "C," WAKEHAM BAY.

CLOSING OF OPERATIONS

Preparations were made as from August 3, 1928, for a return flight to the south, from the scene of operations. All aircraft were conditioned and with the assistance of the Hudson's Bay and Northern Aerial Minerals Exploration, Limited, fuel caches were laid down at various locations along the east side of Hudson bay. All aircraft were successfully rendezvoused at Erik Cove, Cape Wolstenholme, but extremely bad weather conditions set in. Three of the five aircraft took off successfully; one crashed when a pontoon was broken off, and the other failed to get off having engine trouble. This caused the flight south to be abandoned, and radio calls were signalled to the ships of the expedition which returned and salvaged the damaged aircraft and eventually loaded them with the others on board.

This terminated the flying operations of the expedition which returned to Halifax, arriving there in October.

The results of the air patrols observing ice conditions has been compiled by the Department of National Defence, together with maps, tables, photographs, etc., and the whole transferred to the Department of Marine for information and with a view to further action by that department.

STATISTICS

		Hours	Minutes
(a) <i>Flying Time—</i>			
Port Burwell.....		83	46
Nottingham Island.....		134	10
Wakeham Bay.....		151	48
		369	44
(b) <i>Patrols—</i>			
Port Burwell.....		47	
Nottingham Island.....		82	
Wakeham Bay.....		98	
(c) <i>Photographs, air—</i>			Exposures
1. Port Burwell—Using Fairchild Camera.....			225
Nottingham Island—Using Fairchild Camera.....			307
Wakeham Bay—Using Fairchild Camera.....			1,024
2. Port Burwell—Using A.1 Camera.....			2
Nottingham Island—Using A.1 Camera.....			449
Wakeham Bay—Using A.1 Camera.....			278

CHAPTER 9

AERONAUTICAL ENGINEERING DIVISION

The Chief Aeronautical Engineer is responsible to the Deputy Minister of National Defence for all technical and engineering matters pertaining to the Air Services, and prescribed by the Air Board Act and Regulations thereunder.

The whole function of the Aeronautical Engineering Division is to act in a consulting capacity for the other branches of the Air Services upon purely technical matters. This division is now organized in three main branches: Research, Airworthiness, and Inspection.

RESEARCH

The most important items during the past year have been the experimental flights carried out on the "Vista" aircraft, which is a single seater all metal flying boat, with "Genet" engine. This aircraft has shown that it is possible to construct a small metal boat without any serious handicaps due to weight, but it has also indicated that a boat of this small size is only suitable for use in sheltered waters, because moderate waves are proportionately very large. These experiments should assist in the production of a small sporting boat, when the demand for an aircraft of this type arises.

A good deal of development work has been done upon the "Wasp" Fairchild aircraft, which has been extensively used for photographic work.

Following the twin engined "Varuna" it was decided to experiment upon a duralumin hull for a flying boat of this size, and the preliminary work upon the design of such a boat has been carried out with Messrs. Canadian Vickers, who are now designing the "Vancouver" aircraft, which is a twin tractor flying boat with a duralumin hull, equipped with "Lynx" engines.

Some work has been done upon the production of the combined ski and wheel, and alternatively upon a combined ski and float. These problems, however, depend largely upon the demand being sufficient to warrant the cost of the experimental work.

AIRWORTHINESS

The Airworthiness Branch has carried out a large number of calculations on the airworthiness of aircraft of different types for the Civil Aviation Branch. This work although of a routine nature, now occupies a considerable portion of the work of the Engineering Branch, and is likely to grow with the growth of the industry.

By an agreement with the United States, airworthiness certificates issued by the United States Department of Commerce for aircraft built in the United States are now recognized for acceptance in Canada, and on the other hand Canadian certificates for aircraft built in Canada are recognized for acceptance by the United States. This exchange has necessitated a good deal of investigation work upon the methods used by the United States Department of Commerce and those previously used in Canada.

INSPECTION

With the growth of the aircraft industry in Canada, the inspection of aircraft during construction for the purpose of granting certificates, has been increased.

Aircraft Inspection Detachments are now stationed at Montreal and in the Ottawa district, and provision is being made for the establishment of another detachment in the Winnipeg district.

It has not been the policy of the department to carry out detailed inspection of aircraft under construction, except in the case of new aircraft manufacturing companies, but the inspection has been limited to periodical inspection during the course of manufacture, relying upon the inspection carried out by the manufacturing companies themselves for all detailed inspection.

The Chief Aeronautical Engineer represents the Department upon the Canadian Engineering Standards Association and the Associate Air Research Committee, which is one of the Committees of the National Research Council.

The Air Research Committee have carried out a number of interesting researches during the past year, including the commencement of the determination of the complete stability of a flying boat type of aircraft. This work is being done under the direction of Professor Parkin at Toronto University, and should be completed during the coming year.

In the summer of the past year a visit was made to Europe for the purpose of studying the aircraft industries in various countries and for the purpose of obtaining the latest information that might be employed in Canada. A great deal of information was obtained that can be used to good advantage, particularly upon the construction of metal aircraft.

This division supplied a representative for the International Convention for Civil Aviation held at Washington at the end of the year, when a number of interesting questions were considered. Amongst them was the proposal from the Canadian delegation that a real international standard for airworthiness should be set up, or at any rate that the preliminary discussions towards this end should be commenced.

In the field of lighter-than-air aviation, this Division has acted in a consulting capacity to the Civil Aviation Branch and to the Public Works Department upon the construction of the mooring tower and facilities for handling airships at St. Hubert Airport.

These questions were investigated not only in Europe, but also by visiting the Airship Station at Lakehurst during the landing of the Graf Zeppelin, and investigating the facilities provided by the United States authorities on this occasion.

CHAPTER 10

THE AIRCRAFT INDUSTRY

An industry to construct in Canada the aircraft and equipment required for aviation is essential to the sound development of flying. Previous to the war there was no organized industry. A number of experimental flying machines of different types were built in the early days of flying. Dr. Graham Bell was the leader in this early work and built some interesting types at Baddeck, N.S., which were successfully flown.

In 1916 a factory was established in Toronto by the Imperial Munitions Board to meet war demands and a large number of aircraft were built for use in the training camps for flying in Canada, and for export. After the armistice there was no demand for new aircraft and surplus war types were thrown on the market at cheap prices and the industry ceased for the time being. In 1923 the demand for civil aircraft in Canada became urgent and the manufacture of aircraft began in earnest.

CANADIAN VICKERS LIMITED

Canadian Vickers obtained the first contract to construct eight Amphibian aircraft, a condition of the contract being that they should be manufactured in Canada. They established at their plant in Montreal, an aircraft branch with the necessary equipment for the construction of aeroplanes and flying boats. In 1924 further contracts were obtained, both from the Government and the commercial operating companies, and they added to their plant a Design Department to undertake the development of special types to suit Canadian conditions. Their first product was the "Vedette", a three-seater flying boat specially built for forest patrols, sketching, light transportation and air photography. In 1925 the "Varuna", a fire suppression flying boat, was designed and built and the shops kept busy on aircraft construction. In 1926-27 a number of "Vedettes" were built for the Government and Commercial Companies. Designs of new types were also undertaken to meet the requirements of the Government in their civil operations. These were the "Vanessa", with a "Lynx" or Wright engine, a Cabin Biplane with capacity for four passengers in addition to the pilot, and capable of operating on floats, wheels or skis; the "Vista", a single-seater metal hull Monoplane with Armstrong-Siddeley 87 h.p. "Genet" engine; the "Velos", specially designed for photographic operations and survey work, the crew consisting of pilot, navigator and photographer; the "Vigil", a two-seater plane for forest patrol light transportation or training, fitted for use with skis, floats or wheels.

The program of construction for 1928 included twelve Avro aeroplanes, four new hulls for "Viking" Amphibians; nine "Vedette" three-seater observation and photographic flying boats for forest patrol for the Department of National Defence, and other contracts to commercial companies.

The "Vedette", an entirely Canadian product, has a fine record and is attracting attention abroad. A foreign government has placed an order for six. A later development is the Amphibian "Vedette" with wheel landing gear. Skis may be substituted for winter service. This Amphibian has been thoroughly tried out and has proved extremely successful. In the future, "Vedettes" of both types will be fitted with new 300-horsepower Wright engines.

The Government experimental patrol machine, the "Vigil", intended for the Rocky mountains region, was completed and tested. Canadian Vickers Limited also catered to a demand for medium-sized commercial air transports of the cabin type, fitted with higher powered engines and suited for passenger, mail-freight and general purposes, by constructing under license twelve Fairchild five-seater monoplanes. This arrangement was terminated late in the year and agreements with Fokker Aircraft Corporation of New York, were entered into for the exclusive construction rights in Canada for aircraft of Fokker design.

During the year this firm increased the use of metal in aircraft construction. Steel tube fuselages, landing gear and tail units are standard; duralumin enters into the construction of hulls, floats and skis. This made necessary extensions in metal working departments, additional equipment and increased staff. A special salt bath for the heat treatment of duralumin was installed. These shops have been working at great pressure. A growing business in repair work is being built up. Many types of aeroplanes have been inspected, damages repaired or refitments made. New wings were specially designed and fitted to several H.S. 2L flying boats.

Towards the end of the year preparations for the 1929 requirements began. A large program of work was set out, including machines of the company's own design and extensive production of Fokker Super-Universal transports having 410 horsepower "Wasp" or 440 horsepower "Jupiter" engines, carrying two pilots and six passengers, delivery of which are urgently required for the spring.

Construction of the large Tri-motor Fokker air liners will be undertaken when the demand justifies this. The construction in hand has made it necessary to double the capacity of their factory. Plans were got out and the work is well advanced. A modern watertank for the testing of hydrodynamic performance of scale models of floats and hulls is to be installed.

A number of experimental machines of new designs will be built and tested during 1929. Land machines are tested at St. Hubert Airport, and flying boats at Canadian Vickers Customs Airharbour alongside the works, which has been visited by a large number of seaplanes and is the point of entry for many aircraft from the United States.

DEHAVILLAND AIRCRAFT OF CANADA LIMITED

This firm established a plant at Mount Dennis, Toronto, for the service and assembly of their aircraft. During the year they have delivered 62 aircraft to users in Canada; including D.H. 60 "Moths," fitted with the "Cirrus" 75/80 horsepower, Mark II and "Cirrus" 85/95 horsepower, Mark III, and "Gipsy" 85/100 horsepower engines, also DH. 61's fitted with 450 horsepower "Jupiter" engines. The "Moth" has been extensively used and was the type selected by the Government for issue to the Light Aeroplane Clubs.

At the end of the year, orders for fifty additional aircraft were obtained for delivery in the spring of 1929. In 1928 the new DeHavilland "Gipsy" engine was produced, also a new metal fuselage, which is a decided improvement over the previous type.

Considerable experimental work has been carried out at their factory in order to produce components and special accessories to meet all Canadian flying conditions. They have enlarged their factory and plans are being made to construct their aircraft wholly in Canada.

CURTISS-REID AIRCRAFT COMPANY LIMITED

The Reid Aircraft Company was incorporated in February, 1928, with a view to manufacturing aircraft. An airport, consisting of 242 acres, was established at Cartierville, seven miles from Montreal. Two hangars were erected in which the manufacture of an aeroplane was begun.

In January, 1929, the Reid Aircraft Company was merged with the Curtiss Aeroplane and Motor Company of the United States. The new company conducts business under the name of the Curtiss-Reid Aircraft Company Limited, and is incorporated under Letters Patent of the Dominion.

Their first product is the "Reid Rambler," manufactured entirely of metal and covered with fabric. It is a two-seater light aeroplane. It has a welded steel fuselage, folding wings with duralumin spars and ribs covered with fabric, and is fitted with the "Cirrus" Mark II or Mark III, engine. The machine has been specially designed for the use of flying clubs, training schools, private owners, forest patrol and transportation companies where economical transportation of single passengers or an equivalent weight of freight is required. This aircraft has a top speed of 105 m.p.h. cruising speed, 85/90 m.p.h., a service ceiling of 16,000 feet and the rate of climb, near the ground, is 800 feet per minute.

OTTAWA CAR COMPANY LIMITED

For some years this Company have done reconditioning work for the Government and commercial operators. They have arranged with the A. V. Roe, and the Consolidated Aircraft Company of Buffalo, New York, for the service, assembly and distribution of their products. These include the Avro "Avian," fitted with the Armstrong-Siddeley 85 horsepower "Genet," and the Consolidated "Courier" fitted with Wright J5. 220 horsepower engine.

ARMSTRONG-SIDDELEY MOTORS LIMITED

This firm established a branch in Ottawa for the service, assembly and repair of their aero engines in Canada. Their engines at present in use in Canada, are the 455 horsepower "Jaguar," 225 horsepower "Lynx," and 85 horsepower "Genet." They also produce the 140 horsepower "Mongoose" and 750 horsepower "Leopard" engines.

CANADIAN WRIGHT LIMITED

The Wright Aeronautical Corporation of Patterson, New Jersey, established a plant in Montreal for the assembly, service and distribution of their "Whirlwind" engines, and are incorporated as Canadian Wright Limited. They offer every facility for delivery and subsequent service of their engines. A large number of their engines are used in Canada. They are also the Service Agents for the DeHavilland "Gipsy" engine in Canada.

CANADIAN PRATT & WHITNEY AIRCRAFT Co., LTD.

Pratt & Whitney Aircraft Company of Hartford, Connecticut, U.S.A., has formed a Canadian company for the assembling, overhauling, servicing and distribution of their engines. A plant has been established at Longueuil, Montreal. Their products are the 410 horse-power "Wasp" and 525 horse-power "Hornet" engines. A large number of "Wasp" engines are used by Canadian operators.

The Bristol Aircraft Company of England are forming a branch in Canada for the assembly and service of their engines. They manufacture the 400 horse-power Bristol "Jupiter" and 80/100 horse-power "Cherub" engines. The "Jupiter" is fitted to the DeHavilland 61 and a number are in use in Canada.

During the year 264 aircraft were operated by civil organizations, and 63 aircraft operated by the Directorate of Civil Government Operations, making a total of 327 aircraft used in civil activities. A large number of these are of British and United States manufacture, but there has been a marked increase in Canadian manufactured aircraft. The establishment of these manufacturing and assembling facilities ensure in future that the larger part of the requirements of the Canadian market will be met by increased production in Canada. The requirements of Government and commercial services should suffice for the maintenance of a gradually increasing aircraft industry in Canada, so necessary to the success of aviation.

CHAPTER 11

ST. HUBERT AIRPORT AND AIRSHIP BASE

AIRSHIP DEVELOPMENT

The support of Canada in the development of a system of Empire air communications by airship, was promised by the Prime Minister at the Imperial Conference in 1926, by the construction of an airship base in Eastern Canada. Provision was made for the purchase of a suitable site, and preliminary development work, in the estimates for the financial year 1927-28. The Air Ministry was invited to send two officers to advise on the choice of a suitable location. Major C. H. Scott, in charge of airship development in the Royal Airship factory at Cardington, and Mr. A. R. Gibbs, of the Civil Engineering Staff Works Department at the Air Ministry, London, visited Canada for this purpose in the summer of 1927. After the examination of all likely areas in Eastern Canada, they reported that the best site seen was at St. Hubert, some seven miles east of Montreal, covering an area of 729 arpents.

Their recommendation was accepted and authority granted by Order in Council No. 1233, dated June 24, 1927, for the purchase, by private treaty or expropriation, of the site. The Public Works Department conducted the negotiations with the owners and the purchase was completed in August, 1927. Work was immediately started on the survey of the property, plans for its development, and clearing and drainage of the site.

The engineering work was undertaken by the Chief Engineer's Branch of the Department of Public Works, and the thanks of this department are due to that branch for their ready co-operation and the energy with which the construction has been carried out.

During 1928 good progress was made in this development. A steel mooring tower has been erected and equipped with the most efficient machinery obtainable. The tower head was built in England, under Air Ministry supervision, together with two others, one for South Africa and one for Egypt. A silicol hydrogen gas plant is being installed and housing of the base is nearing completion. Steel work for elevator, and elevator installation is proceeding and it is anticipated that the whole of the work required for the trial flights will be completed by May 1, 1929, and in readiness for the reception of the British airship R. 100, which it is expected will make its first transatlantic passage in 1929.

AERODROME DEVELOPMENT

St. Hubert is also being developed to form a great public air terminal aerodrome which may be used on equitable terms by all desiring to do so. In November, 1927, the demand for aerodrome facilities became urgent and a temporary aerodrome was cleared and graded, adjacent to the tower, for use while the permanent aerodrome was under construction. A temporary wooden hangar was erected to shelter visiting aircraft. The aerodrome was first used in November, 1927, in connection with air mail experimental flights from Rimouski for the Post Office.

In 1928 contracts were let for construction work on the permanent aerodrome and progress was made in the grading, drainage, roads, water supply, etc. Number one permanent hangar, 80 by 120 feet, was completed. An intermediate flood light, tower obstruction lights, and a flashing beacon have been

installed so that night flying is now possible from the field. A Radio Station has been erected and weather reports are being received regularly. A Meteorological Observation Station was established in June, 1928.

It will take some years to carry out the complete plan of development of St. Hubert, but as funds are provided, the airport when complete, will rank as one of the most efficiently equipped airports in the world. In the meantime, facilities adequate for the traffic offering is being furnished.

USE BY PUBLIC

A number of commercial aircraft operating companies use St. Hubert for passenger, freight and mail services. A school of flying is conducted. The Montreal Light Aeroplane Club have rented space for their operations. It is the terminal for the International Air Service between New York and Montreal. Landing fees, storing charges and terms on which land may be leased to commercial operators, to erect their hangars, is set forth in the following schedule:—

	*Light Up to 3,000 lbs. weight	*Medium 3 000 to 6,000 lbs. weight	*Heavy Over 6,000 lbs. weight
Landing fee, including storage on ground for one day or part thereof.	\$ 1 00	\$ 2 00	\$ 3 00
Storage fees per aircraft per day or fraction thereof, including landing privileges:—			
(a) Ground space.....	1 00	2 00	3 00
(b) Hangar space.....	2 00	3 00	4 00
Dead storage, ground space only, limited to 14 days	0 50	1 00	2 00
Monthly hangar storage fees per aircraft, including landing privileges..	30 00	45 00	60 00
Heated hangar space per aircraft per diem, including landing privileges.	3 00	4 00	5 00
Monthly heated hangar storage fees per aircraft, including landing privileges	40 00	60 00	75 00
Passenger toll for each passenger carried for hire except passenger in transit.....		0 10	
Light aeroplanes in use by clubs and club members.			
Monthly charges per aircraft in operation.....		15 00	
Mechanician services per hour.....		1 50	From 8 hours to 17 hours daily.
Mechanician helper per hour.....		1 00	

Rental of ground for building purposes. All plans of proposed buildings must be submitted for approval to Department of National Defence, \$50 per acre per annum.

All aircraft must be registered at the office of the aerodrome superintendent.

All commercial and other aircraft in transit not attached to the aerodrome or operating therefrom must be registered immediately upon arrival and be checked out upon departure.

Landing fees must be paid at the time of registration.

Tolls for passengers must be paid at the close of each day by the operators of passenger-carrying aircraft.

All fees for planes in transit must be paid in cash.

No landing fee or service charges shall be collected for aircraft in the service of the Department of National Defence.

No landing fee or service charges shall be collected from visiting aircraft of the United States Army, Navy, Marine and Department of Commerce.

*Weights given are total authorized weight according to Certificate of Airworthiness.

The revenue from this source is as follows:—

From May 1 to December 31, 1928—

Storage and landing fees.....	\$ 838 60
Hangar space rental and ground fees.....	2,250 50
Passenger fees.....	125 10
Tractor and truck service, and labour.....	154 60
Total.....	\$ 3,368 80

The traffic returns of international business transacted from October 1 to December 31, at the Government Air Harbour, St. Hubert, Montreal, are as follows:—

	In	Out	Total
Number of Canadian aircraft.....	61	61)	191
Number of Foreign aircraft.....	35	34)	
Number of passengers.....	81	85	166
Express and baggage from United States.....			123
Number of mail bags carried.....			1,000
Pounds of mail carried.....			30,500
Approximate number of hours flown.....			458
Mileage of international traffic flown.....			45,428

APPENDIX "A"

PROGRESS ABROAD

In all parts of the world civil aviation is increasing rapidly. In 1928 there was a large increase both in mileage and traffic over air routes. Very large sums are spent by Governments in support of these lines, either by subsidies or air mail contracts. New routes are coming into being every year and old ones are being extended.

Europe is now a network of lines connecting all parts of the continent and reaching out into Africa and Asia. On the American continent national lines are being linked up and travel and transport by air will soon be possible between all important industrial centres.

Civil aviation in every country is being assisted by the enactment of air regulations to protect the public: aerodromes, lighting systems, radio, and meteorological services are provided at the public expense; research and engineering development with Government support leads to a continual advance in aeronautical science.

As more efficient types of engines and aircraft are introduced and ground facilities improve, the safety of air travel will be increased and with it public confidence and support.

BRITISH SERVICES

Imperial Airways Limited operate regular services under contract with the British Government, the terms of which provided for a subsidy of £1,000,000 sterling paid over a period of ten years, which began with £186,000 sterling in 1924, and gradually decreases each year until at the end of this period it is hoped that the air lines may be self-sustaining.

Daily services are operated between London-Paris-Zurich, and London-Brussels-Cologne; and weekly services between Southampton and the Channel Islands. These routes cover 1,090 miles. During 1928 a total of 793,365 miles were flown, 24,820 passengers carried, and 742 tons of goods and mail conveyed. These figures show an increase over 1927, which are: miles flown, 614,655; passengers carried, 16,533; goods and mail conveyed, 576 tons.

This contract has been extended by the addition of a subsidy for a weekly service on the London-Karachi, India route, which will be inaugurated in April, 1929. That part of the route lying between Cairo and Basra is now in operation and for two years has been flown with the greatest regularity. The whole journey of 5,000 miles will be covered in six days. Passengers will fly from London to Basle and thence by night train to Genoa, reached in about twenty-four hours of leaving London. A flying boat service will cross the Mediterranean to Egypt in a two days' journey. The flight across the desert to Bagdad will be made in one day and the final stage of two days passes down the Persian Gulf and along the coast to Karachi. The Indian Government have under consideration extensions from Karachi to Bombay, Delhi, Calcutta and Rangoon. A further extension from Rangoon to Singapore and finally to Australia can be visualized.

In November, 1927, Sir Alan Cobham commenced a survey around Africa by air, a distance of some 22,000 miles, which was completed in May, 1928. The route was via Marseilles, Aboukir, Khartoum, Fort Johnson, Durban, to

Cape Town, returning along the west coast of Africa to Gibraltar and via Barcelona, to London. A Short "Singapore" all metal flying boat was used, and carried a crew of six. Arrangements are now being completed for a service, connecting with the route from London at Alexandria up the Nile, via Khartoum to Mwanza on the Victoria Nyanza, by a flying boat service, with further extensions through central Africa to Rhodesia and thence southward to the Cape.

In the light aeroplane field Great Britain is still supreme. There has been a large demand for British light aircraft abroad. Six world air records for endurance, speed, and altitude were held by light aircraft in England. The altitude record for light planes was established by Lady Heath in a D.H. Moth, when she reached a height of about 23,000 feet.

The light aeroplane club movement in England, given financial assistance by the Air Ministry, continues to grow. Some fifteen clubs have been formed, and a successful season was reported.

The first municipally owned airport in Great Britain is in Manchester, and a level expanse of some 260 acres, within seven miles of the centre of the city, has been approved by the Air Ministry, and equipped by the municipality for public use.

DOMINIONS AND COLONIES

AUSTRALIA

During 1928, regular passenger, freight, and mail services were operated over the following routes: Perth-Derby, Charleville-Camooweal, Adelaide-Cootamundra, Broken Hill-Mildura.

Since the commencement of operations in December, 1921, to December 31, 1928, 2,220,894 miles have been flown; 15,049 passengers, 334,717 pounds of goods, and 1,566,177 letters carried.

Further services are contemplated for the following routes, which will commence early in 1929: Adelaide-Perth, Camooweal-Daily Waters, Charleville-Brisbane.

The Contractor for the Adelaide-Perth service will receive 12/8d. per pound for the carriage of mails, and has been guaranteed a load of 600 pounds each trip. Necessary landing grounds and night lighting equipment will be prepared and provided by the Australian Government. The contractor, however, is required to operate and maintain the night lighting equipment at his own expense. This contract is for a term of five years, and has been let to West Australian Airways Limited.

The Larkin Aircraft Supply Company has been awarded the contract for the service, Camooweal-Daily Waters. A weekly service will be maintained. The contractor will receive 3/4½d. per mile for the period of the contract, which is for three years.

The Queensland and Northern Territory Aerial Services Limited have been awarded the service, Charleville-Brisbane, and a weekly service will be maintained over a period of three years. The subsidy payable is to be 3/3 per mile the first year, 3/1 the second year, and 3/11 for the third year.

The Australian Inland Mission, using the aircraft and personnel of the Q.A.N.T.A.S. Ltd., operated an ambulance aircraft in connection with their missionary work.

Six light aeroplane clubs operated during 1928 at Sydney, Melbourne, Adelaide, Coldbank, Perth, and Brisbane. During the year, 124 pupils obtained licenses.

On December 31, 1928, licenses were in force as follows: 178 private, and 103 commercial pilots, 182 ground engineers, 122 aircraft, and 171 aerodromes.

NEW GUINEA

Four companies are operating services from Lae to the Bulolo Gold Fields.

NEW ZEALAND

Assistance is being given by the Government to three light aeroplane clubs at Christ Church, Auckland, and Blenheim. Standard regulations are being prepared for the assistance of light aeroplane clubs, and some twenty-three have been formed throughout the country. New Zealand Government's policy is to get the three above-mentioned clubs firmly established before considering applications from other clubs.

A general air transport company has been formed at Dunedin to be known as New Zealand Airways Limited.

INDIA AND CEYLON

Light Aeroplane Clubs have been formed at Karachi, Delhi, Bombay, Calcutta, and Bengal, and a club is being formed in Ceylon. Government assistance will be given to these clubs, and they will be under the control of the Aero Club of India and Burma, which received a Government subsidy of 30,000 rupees in 1928.

Selected Indians for employment in Indian civil aviation will receive training in civil aviation in England, and the Government are granting ten scholarships spread over a period of four years. The Government proposal to ask for tenders for the running of regular weekly services between Karachi-Rangoon has been approved by the Finance Committee of the Indian Legislative Assembly. Subsidies will be paid, and the service will be operated in three sections, Karachi-Delhi, Delhi-Calcutta, and Calcutta-Rangoon.

STRAITS SETTLEMENTS

Singapore Flying Club is in active operation, using light seaplanes.

KENYA

The establishment of routes between Kisumee-Nairobi, Nairobi-to the frontier towards Arusha, for South Africa, and Nairobi-Mombassa, are contemplated by the Government.

The Aero Club of East Africa is in active operation. The British East African Airways Limited is being formed, for passenger and freight transportation.

EGYPT AND TANGANYIKA

The operation of a service from Alexandria (Egypt) to Mwanza (Tanganyika), with an extension later to South Africa, is being contemplated. The Cobham-Blackburn Air Lines Limited and the Imperial Airways Limited are co-operating in the establishment of this through service.

SOUTH AFRICA

Five light aeroplane clubs were in active operation during 1928, at Cape Town, Durban, East London, Johannesburg, and Fort Elizabeth. No Government assistance has been granted to these clubs.

Aeros Proprietary Limited, African Aerial Travels, The Aircraft Company, and Devices Limited, were formed during the year, and operated light aircraft.

GERMANY

EUROPEAN

Forbidden by the Peace Treaty to maintain a large Air Force, financial support and popular interest has been concentrated on the development of civil aviation. The Deutsche Lufthansa operates all air traffic in Germany. At the end of November, 1928, this company owned 215 aircraft. During the year, the network of air services was extended and about 90 services were operated during the summer, of which only 14 operated throughout the winter. Every important city is included in the air chain and connections are made with other countries in every direction.

The Berlin-Ronigsberg and Berlin-Hanover lines are now equipped for night flying. The Berlin-Hanover route has been divided into three sections, red lights being employed on the first section, white on the second, and red again on the third. The pilot is thus able to locate his position en route. Further extensions of the Lufthansa lines are contemplated to reach South America, North Africa, the Canary Islands, and Brazil.

The Reich vote for civil aviation for the financial year 1928-29 amounted to 52,734,395 marks, of which 20,165,000 was allocated as air transport subsidy. The Reich vote is supplemented by the States and Municipalities, and in 1928 the sums appropriated by the States totalled 5,900,000 marks, and contributions from various municipal authorities are reported to have exceeded 3,500,000 marks.

During the year approximately 400 pilots were trained and obtained certificates, and some 500 pupils received training in gliding flight at the two schools of the Rhon-Rossitten Gesellschaft.

Great efforts are made to attract public interest, especially among school children. The Prussian Ministry of Trade, Ministry of Science, Art and Education have recommended the inclusion of the study of the principles and commercial value of flying in the curriculum of Prussian schools.

In March, 1928, the first aeroplane flight across the Atlantic from east to west was made by two German airmen, Baron von Huenefeld and Captain Kohl, accompanied by Major Fitzmaurice of the Irish Free State. The aircraft took off from Baldonnell Aerodrome near Dublin, Ireland, and landed at Greenly Island in the Straits of Belle Isle, off the coast of Labrador. The aircraft used was a Junkers of the "Bremen" type. A double transatlantic flight was also made by the Zeppelin airship L.Z. 127 in October.

Twenty-two nations participated in an international exhibition of aircraft held in Berlin from October 7 to 28, and approximately half a million people visited the exhibition.

Statistics for the year show the following, compared with 1927:—

	1927	1928
Passengers carried.....	102,691	111,000
Miles flown.....	5,721,592	6,250,000
Freight and mail carried (lbs.).....	883,143	3,030,000

FRANCE

The French Government civil aviation vote for 1928 amounted to 217,647,-140 francs. During the year an Air Ministry was created under the direction of M. Eynac, the former Under Secretary of State for Aeronautics and Aerial Transport.

The Paris-London, Paris-Marseilles, with branch line Lyon-Geneva (daily services), and a bi-weekly service, Antibes-Ajaccio-Tunis, are operated by the Air Union.

Daily services between Paris-Cologne-Essen-Berlin and Paris-Brussels-Rotterdam-Amsterdam are operated by the Société Générale de Transports Aériens (Farman).

Paris - Strasbourg - Nurembourg - Prague - Vienna - Budapest - Belgrade - Bucharest - Constantinople lines are operated by the Compagnie Internationale de Navigation Aérienne.

A daily combined passenger, freight and mail service between Toulouse-Perpignan-Barcelona and other points in Spain, is operated by the Cie Générale Aéropostale. This company extended these routes to South America by means of a weekly combined air and maritime mail service from Dakar (St. Louis) to Buenos Aires. The section, St. Louis to Natal, was operated by steamers, aircraft completing the journey. Further extensions are contemplated to the West Indies, and the company is also studying a route to the Belgian Congo.

A service from Marseilles to Algiers was opened in August by the Cie France-Algérie, a subsidiary of the Cie Générale Aéropostale.

The Compagnie Aérienne Française commenced summer weekly services between Paris and Cherbourg to connect the latter place with the arrival of transatlantic liners between Marseilles and Nice. In November a taxi service from Calais to Dover was also operated.

The Société Anonyme pour le Développement de l'Aviation Commerciale Française has been formed by the French railways system with the object of developing combined rail and air services. It is proposed to inaugurate the service in the spring of 1929 for the carriage of mails between Bordeaux, Lyons and Geneva.

During the summer, the steamship *Ile de France*, plying between Cherbourg and New York, was equipped with catapult gear for launching aircraft at sea. A number of successful flights were made some 400 miles from the port of destination, in an amphibian, which was successfully launched and effected a saving of 24 hours in the arrival of the mails.

Three long-distance flights were carried out during the year: the flight around the world by M. Coste and Le Brix; a return flight from Paris to Timbuctoo, in four and a half days; and a flight to the Cape.

Statistics for 1928 are not yet available, but during 1927 at Le Bourget Airport, Paris, the figures were: departures and arrivals of aircraft, 12,744; passengers carried, 38,081; freight, 840,000 kgs.; mail carried, 112,550 kgs. The Colonial Airport at Casablanca, Morocco, had the following figures: departures and arrivals of aircraft, 1,134; passengers, 758; freight, 9,950 kgs.; mail, 60,960 kgs.

There are at present in France, five airports, 20 regular landing fields, 43 emergency landing fields, and 9 hydroplane bases.

RUSSIA

A daily air mail service between Riga-Talliw-Leningrad is being operated by the Deruloft Company in connection with the Berlin-Kronigsberg-Riga night air mail service.

A service is also run between Moscow-Novosibirsk via Nishni-Novgoid-Kazan-Svordlovak-Kurgan-Omsk. A section of the route between Nishni-Novgoid-Kazan is being equipped for night flying, and the whole journey will be completed in 36 hours as compared with 52 hours by express train.

HOLLAND

The Koninklijke Luchtvaart Maatschappij (K.L.M.) operate daily passenger, freight and mail services between Amsterdam-London via Rotterdam, Amsterdam-Paris via Rotterdam, Rotterdam-Copenhagen via Amsterdam, and services to Hamburg, Dortmund and Berlin in conjunction with Lufthansa Company.

Extensions of the K.L.M. lines were made by the inauguration of a series of experimental mail flights to the Netherlands and East Indies.

A company with a capital of Fl. 500,000 has been formed for regular mail and passenger services on the routes Batavia-Semarang-Sourabaya, Batavia-Bandoeng, and Batavia-Singapore-Belawn Deli (Medn).

SWEDEN

The aerotransport company, subsidized by the Swedish Government up to the sum of 500,000 Kr., co-operated services from Malmo-Copenhagen-Hamburg-Amsterdam in conjunction with the K.L.M. Also in conjunction with the Finnish Aero O/Y, the route between Stockholm-Helsingfors and Stockholm-Abo were operated.

During the year, 197,600 miles were flown; 14,700 passengers carried; 84 tons of goods, and 14 tons of mail conveyed.

ITALY

Passenger, freight and mail services were operated between the following points: Brindisi-Athens-Constantinople, Genoa-Rome-Naples-Palermo, Turin-Trieste, Trieste-Zara, Rome-Venice-Vienna. Extensions of these lines were inaugurated from Rome to Tripoli, North Africa, and an extension is contemplated to Tobruk.

OTHER COUNTRIES

Norway, Poland, Spain, Czechoslovakia, Hungary and Greece are all developing air lines, so that throughout the Continent of Europe one can travel almost anywhere by aircraft in comfort and safety.

UNITED STATES

The air routes in the United States numbered 45 at the end of 1928, with a total mileage of 16,667. Approximately 10,000,000 miles were flown; 35,000 passengers, 3,959,452 pounds of mail, and 2,500,000 pounds of express were carried. Contracts for further services: from Key West to Christobal; Key West to San Juan, Porto Rico; and Miami to Nassau, were commenced in January, 1929, and further extensions are proposed.

The United States mail services now connect with a service- Laredo-Mexico City, operated by the Mexican Government.

At the end of 1928 there were over 9,341 miles of air routes equipped or under construction for night flying, and progress has been made in lighting arrangements for airports. It is anticipated that by June, 1929, 2,171 more miles will have been added.

There were 352 municipal airports, with an additional 890 under construction or proposed, in December, 1928; also 256 Department of Commerce intermediate fields, marked auxiliary fields, and military and naval airports, making a total of 1,356 aerodromes.

During the year the Curtiss Flying Service was formed and a large and extensive taxi service was carried out. They are establishing schools of flying in twenty-nine cities, and their operations also include air photography and air dusting of crops.

A great increase has taken place in the number of air service operators, excluding air mail contractors, and on December 31, 1928, seventeen were operating over twenty-nine routes with an approximate mileage of 6,127.

Air mail services are being used to a greater degree by banks; some \$24,000,000 in negotiable paper, bearing interest, arrives in Wall Street daily by aircraft from all parts of the United States. It has been estimated that in a year, capital arriving in New York by air will total \$7,200,000,000. Figuring interest at only 2 per cent, the sum of \$144,000,000 in interest is saved by the use of air mail. Banks and investment houses are the largest users of air mail and the second largest users of air express service.

To mark the twenty-fifth anniversary of the Wright Brothers' first flight on heavier-than-air craft, an International Civil Aeronautics Conference was held at Washington from December 12 to 14, and delegates from thirty-seven countries attended.

SOUTH AMERICA

The Pan-American Airways service in operation along the coast of Peru, from Lima to Talara, is to be extended Northward to Panama via Equador and Columbus, and southward to Valparaiso, Chile, across the Andes to Buenos Aires.

JAPAN

During 1928, air mail services were operated between Osaka-Fukuoka, Sakai-Oita, Tokyo-Osaka, and Tokyo-Sondai.

The Nihon Kohkuh Yusoh Kaisha Company has been formed at Tokyo, with a capital of Yen 10,000,000 (approximately \$5,000,000), to operate services between Tokyo-Osaka-Fukuoka-Seoui-Dairen, a distance of 1,289 miles; and between Osaka-Fukuoka-Shanghai, a distance of 901 miles. This company is to receive a Government subsidy of Yen 19,970,000 (approximately \$10,000,000), to be spread over a period of eleven years. Twelve Tri-motor aircraft have been ordered, and a program and tariff drawn up.

ICELAND

During 1928 an air transport company was formed with Icelandic capital, and employs Deutsche Luft Hansa personnel and material. Passenger and mail services from Reykjavik to Akureyri and Vestmannaerns were operated daily, and various places on the Island were also served. The journey from Reykjavik to Akureyri, which formerly occupied nine or ten days on horseback, is now being reached in two hours by aircraft.

This company also co-operated with the Iceland Fishing Association in August, assisting the herring fleets to locate shoals of fish.

APPENDIX "B"

THE DEVELOPMENT OF RADIO COMMUNICATION FOR GOVERNMENT AIR SERVICES IN CANADA

The 1926 Report on Civil Aviation in Canada contained a detailed account of the installation, organization and operation of the system of radio communication established for the Canadian Air Services, and the intention of the present article is to show the expansion and development that has taken place in this system since that date.

SASKATCHEWAN RADIO SYSTEM

During the past few years the forest protective work of the Royal Canadian Air Force has been gradually extended from Manitoba westward into Northern Saskatchewan. This expansion has brought with it additional requirements in communication and the Royal Canadian Signals were last year called upon to instal a suitable system of radio stations to provide for both ground, and air to ground traffic in Saskatchewan. The requirements are quite different from those to be met in Manitoba. The distances are very much shorter in Saskatchewan than in Manitoba but the various Forestry bases are more isolated since there are no railroads, roads or trails, except in the winter time. During the spring, summer and fall, canoes and motorboats constitute the only means for ground transportation.

The Saskatchewan Forestry Department have up to date confined their efforts to the area south of the Churchill river. The headquarters for this district is at Prince Albert, a town of about eight thousand people, situated on the Saskatchewan river, 90 miles north of Saskatoon. The main sub-bases in the area have been located at the famous old Hudson's Bay posts of Ile-a-la-Crosse and Lac la Ronge. Additional territory will be taken over this year and a new sub-base is being created at Pelican Narrows, near the Saskatchewan-Manitoba border.

The waters of the Saskatchewan river at Prince Albert are not entirely satisfactory for flying boats and seaplanes, and the main flying base for the area has therefore been placed at Ladder Lake. This station is three miles from Big River, the last station on the Canadian National Railways line out of Shellbrook, Sask. During the flying season aircraft are detailed to the sub-bases from the main flying base, but the transportation machines and reserve aircraft are held at Ladder Lake.

Due to the fact that the distances between bases are so much shorter in Saskatchewan than in Manitoba the standard 500 watt stations were much too powerful and it became necessary for the Signal Service to design and build lower power equipment to meet this particular situation. The question of transportation was a very important factor as it seemed quite probable that most of the apparatus might have to be flown in to the more northerly stations. Existing Army sets might have been utilized for this work but the upkeep and repair of this type of apparatus is both difficult and expensive, especially in such remote stations. Again, the receiving equipment had to be suitable for reception from air to ground over long distances, and the present Army sets were not designed with this requirement in view. It was, therefore, decided to design special equipment to be manufactured by the Signals Inspection and

Test Department. This decision was in conformity with the policy, originated at the time of the development of the S.I.T.D. 500 watt station, to develop in Canada special equipment to meet Canadian conditions.

The conditions to be met in the design of this equipment may be summed up as follows:—

1. Portability—no individual part to weigh more than 200 pounds.
2. To operate without a station battery.
3. To be automatic in operation.
4. To be capable of being erected by a maximum of two men, and to be operated by one man if necessary.
5. To be capable of being installed in any type of building in any locality.

It would appear from the results of the first year's operations that the S.I.T.D. 100 plant fulfils the conditions laid down in a very satisfactory manner. Plate I shows apparatus installed in test building in Ottawa.

The power plant consists of a small one horse-power automatic Delco set using gasoline as fuel, and developing 32 volts direct current. This plant comes into operation automatically as soon as a load, as low as 25 watts, is connected across the generator terminals. That this plant is as dependable and as fool-proof as other Delco equipment, is amply proven by the thousands of sets now in use by farmers and others throughout Canada and the United States. A further advantage of using equipment of such a standard nature lies in the fact that spare parts can be obtained in almost any part of the country. Due to the elimination of station batteries it was necessary to use alternating currents for the transmitter so that the filaments of the valves could be lighted by a step-down transformer and the plates supplied by a step-up transformer. A 500-watt motor generator set operates from the Delco mains and delivers single phase alternating current at 110 volts, 60 cycles, to the transmitter. Special provision has been made in the design of this motor generator set to minimize voltage fluctuations due to load. The transmitter itself is built on the same plan as our Standard 500 watt transmitter and all parts are easily accessible both for adjustment and for repair. The necessary meters for the proper supervision of the adjustment and operation of the set are provided on the main transmitter panel, while the power transformer, rheostats, valves and main inductance coil are mounted behind the panel. The transmitter employs the well-known Hartley circuit and a rapid variation of wavelength is provided by means of a condenser on the main panel. A double contact keying relay is used in this transmitter, one set of contacts being used to close the grid circuit and the other pair of contacts to control the resistance which is thrown into the filament circuit when the key is up. This protects the valve filaments against voltage surges. An automatic starter controls the motor generator set and is equipped with both armature and field protection. Three push-buttons are provided for the use of the operator. The first push-button places a lamp load across the Delco. This causes the Delco plant to start up. When the pilot light on the transmitter lights, the operator may utilize the second push-button to start up the motor generator set. The third push-button is used to shut down the motor generator set when the transmission is over. Between periods of transmission, the Delco may either be allowed to run or may be shut down by the operator. The power for the operation of the relay in the transmitter is obtained from the voltage drop across a resistance in the pilot lamp circuit. It will thus be seen that the transmitter operates without the use of a station battery of any type.

The receiving set has also been specially designed for this station. The circuit used is a modification of the well-known Browning-Drake receiver now so popular in broadcast reception. The valves employed only require 60 milliamperes for the filament and this power can, therefore, be supplied by

three dry cells. A standard 108-volt dry battery is used to supply the plates of the valves, both for the amplifier and the detector units. Four valves are employed in this receiver, one being a stage of radio frequency amplification, one a detector, and the last two, transformer coupled audio amplification. This circuit is extremely sensitive, very stable and easy to operate. There are only two controls normally employed, although the reaction coil on the radio frequency transformer has been made adjustable so that the set can be instantly adapted for the telephone reception or for telegraph reception.

Both transmitter and receiver are mounted on a table, similar to the table used with the 500-watt set. A standard key is used and the antenna and counterpoise connections are brought in to the main send-receive switch on the transmitter. Only one antenna is used in this case and it is thrown from the transmitter to the receiver when reception is to be carried out.

The antenna system is based somewhat on the type used for the 120-watt set, with the exception that a counterpoise is used in place of a direct ground. No attempt was made to design the counterpoise for minimum resistance, but sufficient area is provided to give satisfactory operation over the distances to be covered. The question of ease of erection has been considered as of more importance than maximum output. The masts are built up from light angle iron but are erected in a manner similar to the 120-watt set masts, or the type "B" mast supplied with the 500 watt station. Light wooden mast bases and anchors are provided so that erection can be carried out on flat rock if necessary. In this case it is only necessary to load down the anchors with loose rock. A two-wire "T" antenna is used, 300 feet long, and supported on 10-foot pipe spreaders. Rubber cord insulators are used throughout in order to minimize weight. The counterpoise is located directly under the antenna and is about two-thirds its length. Three light wooden supports are used, one at either end and one in the centre. The lead-in from the counterpoise is taken off at the centre support. This construction makes it possible to erect the complete antenna system in almost any locality. Buildings already erected may be used provided accommodation can be given for the transmitter either at one end or at one side of the building. A small standard station building was designed for locations where existing buildings were unsuitable. Buildings of this type have been erected in Prince Albert, Ladder Lake and Waskesiu. Exterior views of these buildings are shown in plate II.

In connection with the design of the transmitter, receiver and antenna system, many standard parts which have already been developed for use with 500-watt stations, are being employed. In this way it has been possible to minimize the number of new parts which must be kept in stock in Ottawa. This is becoming an increasingly important problem due to the fact that the department now has in operation a very large number of radio stations scattered throughout the length and breadth of the Dominion of Canada.

The apparatus was assembled and shipped from the Signals Shops in Ottawa as fast as each station was completed. The Forestry Branch and the Civil Government Air Operations Branch arranged for the erection of the necessary buildings at the different bases but the installation of the apparatus was carried out by a special erecting staff from Ottawa under Lieutenant Young of the R.C.C.S. The Prince Albert station was established first, followed by Ladder Lake, Waskesiu, Ile-a-la-Crosse and Lac la Ronge in the order named. Lake Waskesiu is the headquarters for the new Prince Albert National Park, and is located 75 miles north of Prince Albert, in the heart of one of the most beautiful districts in Canada. This park was officially opened by the Prime Minister of Canada on August 10, 1928. At the request of the Dominion Parks Branch an additional 100 watt station was erected at this point to keep the

park in touch with the Parks Branch and Forestry Headquarters in Prince Albert. Some idea of the natural beauty of the park can be obtained from the photographs of plate III.

The new system came into operation as a whole in August of this year, just in time to demonstrate its usefulness during the fall fire-hazard season. A complete schedule was arranged, including morning, afternoon and evening periods for all stations. Prince Albert being made the directing station for the system. Since Saskatchewan flying operations are administered from Air Force headquarters in Winnipeg, it was essential that direct radio communication should be provided to supplement the telegraph service out of Prince Albert. To accomplish this, morning and night periods were arranged between the Cormorant Lake station of the Manitoba system and Ladder Lake in Saskatchewan.

On account of the comparatively short distances between bases in Saskatchewan, a slightly different system of reporting fires has been developed from that in use in Manitoba. Only a few of the patrol machines were fitted with radio apparatus, therefore during each patrol the machines would land at one or more of the sub-stations and send in to forestry headquarters a full and complete report on the conditions encountered in the area covered. This system was adopted on account of the necessity for carrying Forestry Observers and fire fighting apparatus on practically all detection patrols.

The installation of these radio stations in northern Saskatchewan has been a great boon to trading companies and settlers in the district and considerable commercial traffic has already been handled. As a result of this, pressure has been brought to bear, both by the inhabitants and by the large companies trading in the area, to have the stations kept open all year. This request has been met by maintaining the stations at Lac la Ronge and Prince Albert throughout the winter. Commercial traffic is being handled over this part of the system and, while the returns in dollars and cents may not be large, the value of the service in developing the country cannot be denied.

The best indication of the usefulness of any system of communication can be gathered from the reports of the work done and the traffic handled. Tables I and II below cover the work of the Saskatchewan system up to December, 1928. It is pointed out, however, that during the months of November and December only the stations at Lac la Ronge and Prince Albert were in operation.

TABLE I
SASKATCHEWAN RADIO SYSTEM—TRAFFIC REPORT

August to December, 1928

Station	Messages			Words		
	Received	Sent	Total	Received	Sent	Total
Cormorant Lake.....	159	273	432	5,907	8,491	14,398
Prince Albert.....	424	510	934	17,529	19,884	37,413
Ladder Lake.....	691	536	1,227	30,555	19,528	50,083
Ile-a-la Crosse.....	63	153	316	7,688	6,843	14,531
Lac la Ronge.....	194	223	417	5,615	7,099	12,714
Waskesiu.....	43	50	93	1,534	1,734	3,268
Totals.....	1,574	1,745	3,319	68,828	63,579	132,407

TABLE II
SASKATCHEWAN RADIO SYSTEM—OPERATING REPORT
August to December, 1928

Station	Hours Operation		Fuel consumed (American gallons)
	Transmitter	Power plant	
Prince Albert.....	166.5	275.5	82.00
Ladder Lake.....	134.2	600.0	130.50
Ile-a-la-Crosse.....	57.3	277.0	91.00
Lac la Ronge.....	33.6	149.0	39.00
Waskesiu.....	41.5	272.0	66.75
Totals.....	438.1	1,573.5	409.25

MANITOBA RADIO SYSTEM

The four stations of the Manitoba System, located at Winnipeg, Lac du Bonnet, Norway House and Cormorant Lake, have continued to operate successfully during the past two years. It has, however, been found necessary to add two more small stations to this chain. One of these was erected in the fall of 1928 on Snake Island in lake Winnipegosis, near the village of Winnipegosis, and the other will be placed at Berens river on lake Winnipeg in the spring of 1929. These stations will both be of the 100-watt type already described. Berens river will operate as a sub-base for Lac du Bonnet and as a general refuelling base for machines on both north and south patrols. Winnipegosis station is handled from Winnipeg.

Tables III and IV show the data regarding traffic and operation for the Manitoba system for 1928, while table V is a comparison of the figures for the years 1926, 1927 and 1928. Table VI shows the results of all patrols, in which aircraft radio apparatus was used, on the Manitoba system during the past summer.

TABLE III
MANITOBA RADIO SYSTEM—OPERATING REPORT
January to October, 1928

Station	Words handled	Hours Operation		Fuel consumed (American gallons)
		Transmitter	Power plant	
Winnipeg.....	306,439	339	1,045	745
Norway House.....	94,522	125	1,198	722.5
Cormorant Lake.....	179,847	296	1,276	980
Lac du Bonnet.....	82,450	118	598	448.5
Totals.....	666,669	878	4,117	2,896

TABLE IV
MANITOBA RADIO SYSTEM—COMMERCIAL TRAFFIC REPORT
January to October, 1928

	Message	Radio tolls
		\$ cts.
Cormorant Lake.....	583	1,276 12
Norway House.....	431	787 91
	1,014	2,064 03

Commercial traffic for 12 months of 1927..... 4,934 02
NOTE.—Decrease in 1928 due to the fact that traffic for Railways and Canals only handled for three months of 1928.

TABLE V

SASKATCHEWAN AND MANITOBA RADIO SYSTEMS—OPERATING REPORT

Comparison of Years 1926-27 and 1928

Year	Words handled	Hours Operation		Fuel consumed (American gallons)
		Trans-mitter	Power plant	
1926.....	589,488	641	4,276	2,716
1927.....	710,255	763	5,348	3,672
1928.....	772,332	1,254	5,457	2,896

TABLE VI

RESULTS OF PATROLS CARRYING RADIO APPARATUS

May to October, 1928

Station	Number of Patrols			
	Using Radio	100 per cent reception	50 to 100 per cent reception	Less than 50 per cent reception
Norway House.....	22	18	3	1
Cormorant Lake.....	20	12	3	5
Lac du Bonnet.....	15	7	3	5
Winnipegosis.....	17	10	7	....
Totals.....	74	47	16	11

ALBERTA AND BRITISH COLUMBIA SYSTEMS

The station at High River was again operated each year during the flying season, Moth machines equipped with CT21 type aircraft sets being employed. The single mast used during previous years was dismantled in July, 1928, and two of our 100-foot Type "B" latticed steel masts were erected instead. These masts were placed well to one side of the flying field and the radio station was accordingly moved to the new location.

The station at Jericho Beach was closed down temporarily in 1927, but will in all probability be reopened this year since Vancouver is to be used as a flying training base.

AIRCRAFT RADIO APPARATUS

As intimated in the last report a new aircraft transmitter, known as the CT21 set, has been designed and is now being produced in quantity in the Signals Workshop. For the past six years the Royal Canadian Air Force have been using the T21 Aircraft Transmitter as produced for the use of the Royal Air Force in England. This transmitter was originally a war product and was developed to enable long range communication to be carried out between aeroplane and ground. Since the war this set has been improved somewhat in mechanical details and a telephone attachment, in a separate case, was provided in order to allow the pilot to use either speech or key. This set has given good satisfaction in Canada from the point of view of the results obtained, but certain difficulties have been encountered mainly of a mechanical and operational nature. It was to overcome these troubles that the new set was designed.

The photographs of plates IV and V show respectively the front of the set, with all meters and operating controls, and the inside, as viewed from the top.

The new set is contained in a single case 9 inches high, $12\frac{1}{2}$ inches wide and $12\frac{7}{8}$ inches deep. There is, however, an electrical remote control provided for use whenever it is found advisable to mount the set where the pilot cannot reach the switch and voltage control. This attachment carries a duplicate switch, voltage control and output meter, and is contained in a box 6 inches wide, $9\frac{3}{8}$ inches long and $2\frac{3}{4}$ inches deep.

The door shown in the centre of plate IV gives access to the valves so that a defective tube can readily be changed even while in the air. The switch shown at the lower right-hand side of this photograph provides for either telegraphy or telephony by a single throw of the operating handle. All connections to the set from the generator, battery, telegraph key and microphone are made

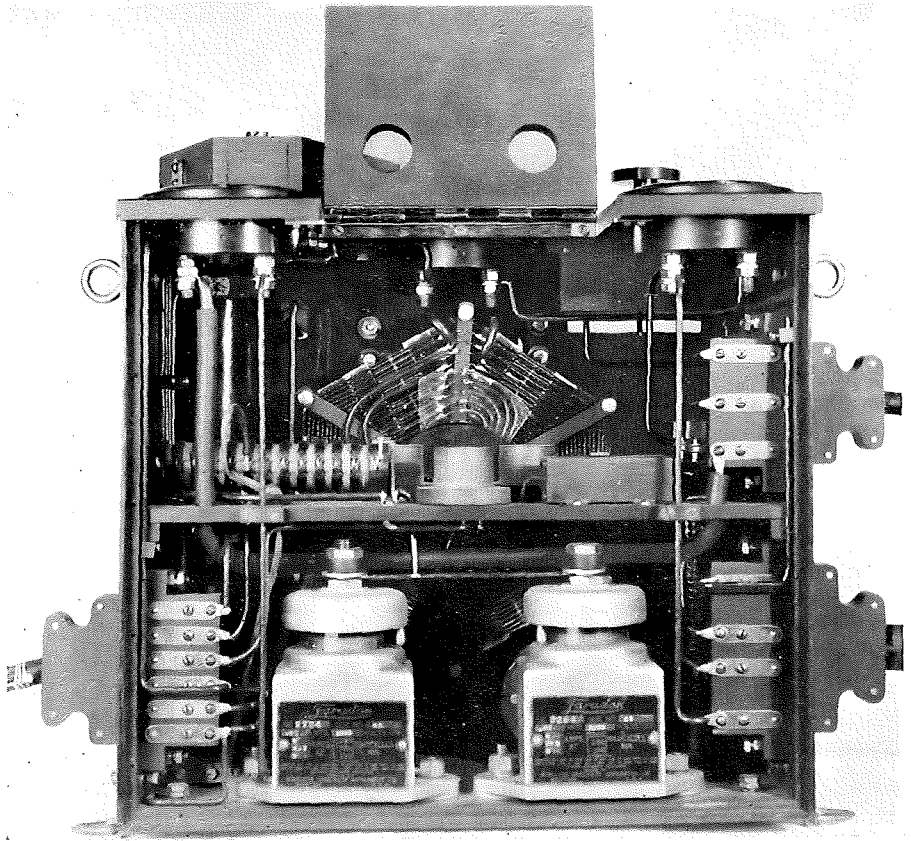


PLATE IV

by means of non-reversible plugs, thus eliminating the possibility of mistakes in connections when replacing a set in a plane. Coil springs are used for mounting the set in the machine. These springs have much greater life than the rubber cords previously used and in addition may be installed in much smaller space.

Special cables are provided for the wiring of the set in the machine. One cable has six wires for the low-tension connections. A second cable carries two heavy automobile cables for the high tension and two smaller wires for the field connections. The third cable is intended for the remote control and has three high-tension wires, one ground wire and five low-tension leads. All cables

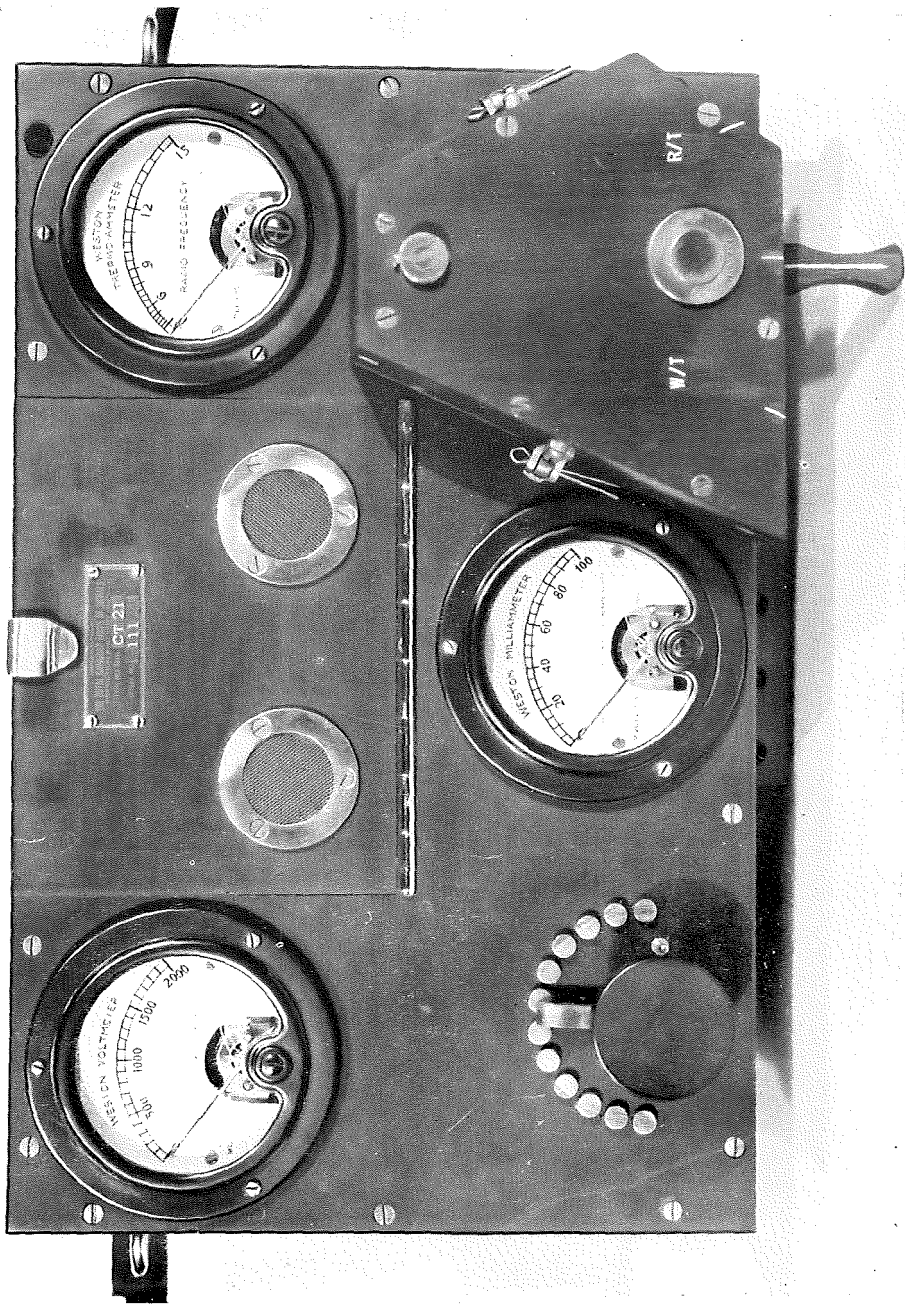


PLATE V

are provided with a colour scheme and tracers to facilitate connections when installations are being first made. These cables have been made up with Empire cloth and cotton brading over the outside to provide the greatest possible protection against the effects of friction and oil.

Weston meters were used throughout the set and all condensers were of high quality high voltage types, thus providing a big factor of safety.

All parts used were of the standard manufacture or else were designed and built from raw materials in the signals shops. This made it possible to secure rapid delivery of materials, either for the manufacture of new sets or for the repair of equipment sent in from the field.

The CT21 transmitter has been in constant use for the past eighteen months both on the Hudson's Strait Expedition and in the Forestry Operations in Manitoba and Saskatchewan. During this time no major difficulties have developed and all reports received have commented on its efficiency and freedom from operating troubles.

It is the intention to redesign the aerial coil and the valve system to allow for the use of more power on telephony, and to adopt double current generators. Constant speed windmills will be employed to give the necessary voltage regulation for both filament and plate supply.

HUDSON'S STRAIT EXPEDITION

In 1927 the Royal Canadian Air Force undertook to provide flying services for the Marine and Fisheries Expedition to Hudson's Strait. The expedition which sailed from Halifax in July carried with it, one officer and three other ranks of the R.C.C.S. to supervise the installation and operation of the aircraft radio system and the air-to-ground communication at the three bases. CT21 aircraft transmitters were used for the planes and standard SITD.2 receivers on the ground.

The report by Captain Laurie, the officer in charge of aircraft radio for the expedition, shows that the range of the CT21 sets were approximately 100 miles when using telephony and up to 500 miles on telegraphy. It was frequently possible to read signals at Nottingham Island at the west end of the strait, from aircraft flying at Port Burwell. During the winter months the pilots preferred to use telegraphy on account of the inconvenience of handling the microphone when face masks and heavy mitts were worn.

The following table gives the results, for each base, of the flights on which radio apparatus was carried:—

Nature of Result	Flights at Bases		
	A	B	C
100 per cent successful.....	42	62	63
50 per cent received.....	1	2	2
Failures.....	1	2	0
Totals.....	44	66	65

On numerous occasions when machines were forced to land on account of fog, clouds or engine failures, the base station was informed of the nature of the trouble and the approximate location of the machine, before the landing was effected. The report contains several instances of help being summoned in this way, but the outstanding radio story of the expedition is the history, as written in the log of the receiving station, of Flight Lieutenant Lewis' landing on the ice in the Atlantic off the coast of Labrador. Unfortunately this machine

could not summon immediate help as they were lost in the fog and so could not give their location. Their call for help was answered by air and by dog team, but without success, although the crew did finally return after a most difficult trip on foot over broken ice and open water. The ill-fated flight which had been started at 1058 hours ended at 1514 hours, and during all this time the base station had been receiving a steady stream of reports by radio. The last few entries in the log read as follows:—

2.43 p.m.—Believe I see land, be unlucky if it isn't, because our petrol is nearly gone.

3.00 p.m.—Cannot see land, petrol nearly gone, don't know where we are.

3.10 p.m.—VVCH. Landing on ice in middle Ungava.

Instead of the middle of Ungava bay they were in the North Atlantic ocean as they discovered the following morning. The story of their return to civilization is too well known to require repetition.

At the request of the Department of Marine and Fisheries, the Department of National Defence undertook to provide the communication between Ottawa and the expedition's base at Wakeham Bay by means of their short wave station here. Contact was effected with the C.G.S. *Stanley* at Halifax before it sailed and was maintained up to December 22, 1927, on which date this work was handed over to the Marine and Fisheries new short wave station, erected in Ottawa for this particular purpose. The traffic handled during this period is given in the following table:—

Period	Number of messages handled	Number of words handled
July 20-Aug. 31, 1927.....	126	4,550
Sept. 1-Sept. 29, 1927.....	114	6,297
Oct. 1-Oct. 31, 1927.....	245	9,034
Nov. 1-Nov. 30, 1927.....	373	16,609
Dec. 1-Dec. 22, 1927.....	227	12,135
Totals.....	1,085	48,625

METEOROLOGICAL REPORTING SYSTEM

At the request of both Air Force and commercial pilots in the west, a system for the broadcasting of weather reports from the various western flying bases was undertaken by the R.C.C.S. in the late summer of 1928. Reports prepared in a form most useful for aeronautical purposes, are now being broadcast morning and evening by the stations at High River, Edmonton, Prince Albert, Cormorant Lake and Winnipeg. Each station copies the reports from all other stations and the combined forecast is passed to the newspapers, local flying clubs and aircraft companies in each locality. This is the beginning of the system of radio aids to air navigation which the Departments intends to instal and operate on all airways in Canada.

AIR MAIL RADIO SERVICES

With the first experimental flights undertaken by the department for the Post Office, it became apparent that a complete system of radio aids to air navigation would be required across Canada before the Air Mail could reach its greatest usefulness. With this end in view a small experimental station was erected at the St. Hubert Aerodrome near Montreal in the fall of 1928. This station is provided with receivers to pick up weather broadcasts from all Canadian and American stations in the eastern half of North America. In addition

a small transmitter was installed to give direct contact with Ottawa and Camp Borden. This station is now giving the pilots first hand information concerning the weather on the Montreal-Toronto and the Ottawa-Montreal routes. This forecast is transmitted just before the plane leaves the aerodrome with its load of mail.

Preparations are now being made to carry out experimental work during the coming summer on the provision of radio beacons, radio direction finders and the transmission of weather information to planes in flight.

It is also expected that the St. Hubert Station will be used during the Experimental flight of the dirigible R100 to America during the early summer of 1929.

APPENDIX "C"

AIR PHOTOGRAPHY FOR TOPOGRAPHICAL SURVEY OF CANADA

During 1928, an extensive program of air photography was carried out by the Directorate, Civil Government Air Operations, Department of National Defence, to meet the demands of the different federal departments. As in previous years, instructions for these operations were prepared by the Topographical Survey of Canada, Department of the Interior, where the centralization of this work and the close co-operation existing between the officials engaged on photographic matters served to promote efficiency and economy in fulfilling the many different requirements. Air photographs were taken from altitudes ranging from a hundred to 14,000 feet above the ground, and using lenses of focal lengths 8 inches, 10 inches, 12 inches or 20 inches for a variety of purposes, such as for making topographic maps and timber maps, for the study of the forest cover, and the nature and extent of the overburden as well as the exposed country rock and the location of such exposure areas, for the study of areas for engineering projects and for illustrating developments either completed or in the course of construction. In all 88,000 photographs were obtained during the year, of which 17,500 were taken with the camera held obliquely, the resulting oblique views covering an area of 33,000 square miles, and the remainder with the camera axis vertical, the vertical views covering an area totalling 31,400 square miles. It might be noted that the most of the air views were taken in connection with the mapping work being carried out by the Topographical Survey of Canada.

OBLIQUE AIR PHOTOGRAPHY

When it is desired to make a preliminary map of a relatively flat area possessing numerous water features, it is now the general procedure to first obliquely photograph from an altitude of 5,000 feet the area to be mapped. This is carried out by photographing from an aircraft possessing an unrestricted view in the direction of travel along parallel flight lines spaced six miles apart, taking photographs in the direction of travel as well as to the right and left thereof. Photographs are also taken along flight lines which intersect at right angles these parallel strip flights. A Fairchild camera equipped with a wide-angled lens is usually employed, and the photography is usually continued until one or more map sheets of the National Topographic series have been entirely covered. Such map sheets, compiled from oblique views, are issued on the four-mile scale, and cover one degree in latitude by two degrees in longitude, and comprise an area of approximately 6,000 square miles.

Working from the Winnipeg Air Base and district sub-bases, oblique air photographs were obtained during the 1928 season covering parts or all of the four mile map sheets of the National Topographic series, as follows:—

Pelican Narrows.....	63M	Dryden.....	52F
Lac la Ronge.....	73P	Rainy Lake.....	52C
South End.....	64D	Island Lake.....	53E
Fitzgerald.....	74E	Deer Lake.....	53D

Preliminary to the issue of the map sheets oblique air photographs, obtained during the 1928 season and previously, are being plotted over the following four-mile map sheets of the National Topographic series:—

Oxford Lake.....	53L	Chipewyn.....	74L
Clair Lake.....	84I	Hecla.....	62P
Peace Point.....	84P	Cross Lake.....	63I

Of the areas over which oblique air photographs were obtained previous to 1928 and the resulting views plotted, the following four-mile map sheets of the National Topographic series were issued by the Topographical Survey of Canada during the past year:—

Kississing.....	63N	Berens River.....	63A
Sioux Lookout.....	52J	Lake St. Joseph.....	52O
Armstrong.....	52I	Norway House.....	63H
Kenora.....	52E		

It might be noted that the extensive prospecting activity now taking place in the vicinity of many areas where oblique air photography is being carried out is creating an urgent demand for the immediate preparation of the map sheets to serve in the development of these areas.

The graphical method at present in use for transferring the detail from the oblique air photographs to the map plot was originated in the Topographical Survey. For the type of country covered and the scale used it is undoubtedly the most rapid and economical method at present available. Further research, however, will probably result in further improvement, possibly by the introduction of time-saving features which are automatic or semi-automatic in their operation.

VERTICAL AIR PHOTOGRAPHY

During 1928 a large program of vertical air photography was carried out for various purposes, such as making topographic maps of the areas photographed, constructing mosaics or photographic representations of important areas, investigating prospective power developments, water storage reservoirs and other engineering problems. The most extensive use was in connection with the preparation for issue by the Topographical Survey of Canada of map sheets on the scale of two miles to the inch. A two-mile map sheet of the National Topographic series covers one degree in longitude and one-half degree in latitude, and comprises an area of approximately 1,500 square miles. Vertical air photographs were obtained during 1928 in the several provinces of Canada over parts or all of the areas covered by the following map sheets:—

Shelburne.....	20	P/N.W.	Nova Scotia
Rosignol.....	21	A/S.W.	"
Moncton.....	21	I/S.W.	New Brunswick
Kempt Lake.....	31	O/S.E.	Quebec
Gatineau Forks.....	31	O/S.W.	"
Rouyn.....	32	D/N.W.	"
Lachute.....	31	G/N.E.	"
Buckingham.....	31	G/N.W.	"
Sundridge.....	31	E/N.W.	Ontario
Magnatawan.....	41	H/N.E.	"
Neepawa, N.W.....	62	G/N.W.	Manitoba
Neepawa, N.E.....	62	G/N.E.	"
Shuswap Lake.....	82	L/N.W.	British Columbia
Fraser Lake.....	93	K/S.E.	"
Burns Lake.....	93	K/S.W.	"

These photographs, 7 inches by 9 inches in size, were mostly from an altitude of 10,000 feet above the ground with a lens of about 8 inches focal length and are now being plotted by the radial intersection method strip by strip.

The procedure with vertical air views is to plot each strip to the average scale of the photographs contained therein on the assumption that each photograph is angle true at the principal point. The strip plot in whole or in part is then reduced, as determined by ground control traverses intersecting the flight, to the scale of one-half mile to an inch. At this scale the strip reductions are compiled, and the compilation is subsequently rephotographed to be printed on the two-mile scale.

In addition to the vertical air photography mentioned above, mineralized areas where detailed examinations are being carried out by the Geological Survey were photographed vertically from the air. Some of these areas are as follows:—

An area of 1,700 square miles in the vicinity of Sudbury, Ont.

An area of about 500 square miles in the vicinity of Kissing Lake, Manitoba; this being part of an area of 1,900 square miles proposed for detailed examination.

An area of about 80 square miles in the vicinity of Rice Lake, Man.

In connection with the investigation by the Dominion Water Power and Reclamation Service and the Ontario Provincial Government of the Lac Seul water storage, an area of 2,300 square miles in the vicinity of the lake was vertically photographed, and the photographic prints from the resulting negatives were used in the field in defining the upper flood line contour.

An area of 400 square miles along the Winnipeg river in the vicinity of Kenora, and an area of 900 square miles along the Nelson river between Cross Lake and Lake Winnipeg were also photographed in connection with the investigations being carried out by the Dominion Water Power and Reclamation Service.

Several small areas were photographed vertically for mosaic assembly purposes. Among these are:—

An experimental forestry tract at Petawawa, Shirley's Bay Air Base, Rockcliffe Air Station, Connaught Rifle Ranges, and Camp Hughes, Manitoba.

In addition to the air photography actually carried out by the Air Service planes, an area was photographed for topographical mapping purposes covering one-mile map sheets 21 L/13; 31 I/15; and 31 I/16; in the vicinity of Quebec city, P.Q., under contract by the Fairchild Aviation Limited, Grande Mere, and 4,000 vertical air photographs were obtained over this area.

INDEXING AND FILING OF AIR PHOTOGRAPHS

Prints of all air photographs taken by the Directorate of Civil Government Air Operations or by private firms for them are recorded, indexed and filed by the Topographical Survey of Canada, where they are available for inspection. During the year over 92,000 air photographs were obtained from the different air bases as follows:—

Vancouver, British Columbia.....	12,260
Winnipeg, Manitoba.....	30,550
Ottawa, Ontario.....	39,660
Dartmouth, Nova Scotia.....	5,500
Fairchild Surveys.....	4,015

The Topographical Survey of Canada was furnished with one print of each of these 92,000 photographs for the index, and also with 90,300 additional prints for various uses, such as for transmission to other federal services, for constructing mosaics, for surveyors' uses in the field, or for distribution on a repayment basis to provincial government officials, city engineers, mining and lumbering corporations, municipalities, etc. At the present time the central index at the Topographical Survey of Canada is made up of 254,000 individual prints.

APPENDIX "D"

AEROPLANE DUSTING EXPERIMENTS

The use of the aeroplane for the application of dust fungicides and insecticides constitutes an advanced step in insect and plant disease control work. Experimental work in the control of the cotton boll weevil has been carried on at the Delta Laboratory at Tallulah, Louisiana, U.S.A., since 1922. Considerable success has been obtained in the practical control of the cotton boll weevil by the use of the aeroplane. A regularly organized commercial aeroplane dusting service has already been made available for this important work.

Aeroplane sulphur dusting experiments for the control of rust were carried on in Manitoba last year. (See Report of the Dominion Botanist, 1927.) The results obtained in these preliminary experiments were extremely promising and thoroughly justified a continuation of this phase of the rust control work.

Profiting by the experience gained last year, the experiments of this season were outlined to determine the feasibility of aeroplane sulphur dusting for the control of rust. The results of the past three years at this laboratory have clearly demonstrated the effectiveness of the sulphur dust treatment in the control of rust. With the effectiveness of the treatment no longer in doubt, it was essential to determine some means of distributing the fungicide efficiently and profitably over extensive areas. For the dusting of large areas of cereal crops, such as occur in Western Canada, the aeroplane is extremely well suited.

Since the cost of the fungicide is one of the most important factors in determining the practical serviceableness of this treatment, it is extremely important to determine the optimum rate and frequency of dust application from the most effective and profitable rust control.

From the results of the 1927 aeroplane dusting trials, it was evident that relatively heavy dust applications are necessary for the effective control of rust. In 1928, aeroplane dusting experiments were outlined to study the effectiveness of various rates and frequencies of dusting, and to determine the feasibility of the aeroplane dusting method for controlling rust over large areas.

Co-operative experiments between the Directorate of Civil Government Air Operations and the Dominion Rust Research Laboratory were continued this year. The Keystone Puffer, a specially designed plane for dusting work, and the one used in experiments last year, was detailed by the Directorate of Civil Government Air Operations for this work.

One of the most important factors in determining the thoroughness of the dust treatment by aeroplane is the care and good judgment of the pilot. A slight error in judgment during a dusting flight means so much crop area improperly dusted, and results in a waste of considerable dusting material. In a large measure the success achieved in the 1927 aeroplane dusting experiments was due to the pilot's skill in handling and manipulating the dusting plane under the most difficult air conditions. The laboratory was again fortunate in having the services of Flying Officer T. M. Shields for this work.

Early in the season, a thorough search was made in Manitoba for satisfactory areas for the experiments. Although the acreage sown to common spring wheat was larger in 1928 than in 1927, nevertheless, considerable difficulty was experienced in locating large fields of common wheat suitable for the dusting operations. However, selections were made in two localities in southern Manitoba. Two fields, comprising an area of 250 acres, were chosen near the town of Morden; and one field of 140 acres was selected at Morris, Man. A small field at Graysville was also dusted.

EXPERIMENTAL METHODS

In Manitoba, the spring of 1928 was favourable for the early sowing of grain crops, and subsequent weather conditions permitted a rapid, vigorous, and uniform development of the young plants.

LOCATION OF DUSTING AREAS

The fields selected for this year's trials consisted of Marquis wheat growing on summer-fallow. These fields were conveniently near satisfactory landing bases. It is extremely important when selecting areas for aeroplane dusting operations to give considerable attention to the availability of desirable landing fields. In each dusting area, a level pasture field comprising an area of approximately thirty acres was used for this purpose. In a field of this type the pilot was able to take off, or land the machine, from any direction. Long smooth runways are particularly desirable when the plane has to take off with a 500-pound load of dust.

DUSTING METHODS

All the dusting was done with a "Keystone Puffer," a machine specially constructed for dusting work and used in the trials last year (Report of Dominion Botanist, 1927). In all of the aeroplane experiments, Kolodust, a finely divided sulphur manufactured by the Niagara Sprayer Company, was used.

The usual manner of treating a field consisted of flying back and forth over the growing crop, permitting the dust clouds to overlap very slightly. The aeroplane was loaded with 500 pounds of sulphur and was flown over the field at a height of from 10 to 20 feet and at a speed of from 100 to 110 miles per hour. When favourable air conditions prevailed and with a hopper valve opening of $1\frac{3}{4}$ inches the machine would put out a dust cloud which would cover a strip of wheat from 90 to 100 feet wide. Under these conditions the fungicide was applied at an approximate rate of 25 pounds per acre. In this work, with landing bases centrally and conveniently situated and with straightaway dusting flights from three-fourths to one mile long, it was possible to dust effectively 100 acres per hour. Fifteen minutes was the time required to load the machine, take off, distribute 500 pounds of sulphur, and return to the landing field for another load.

CHECK PLOTS

The most satisfactory control plots can be obtained when the fields under experiment are large and continuous. In order to avoid the effect of dust drifting, a difficulty so often encountered in aeroplane dusting experiments, a strip of crop from 150 to 200 feet wide was left between the treated and untreated portions of each field. This area acted as a satisfactory buffer plot and prevented significant quantities of the dust from drifting on the areas which served as checks, during the progress of the dusting operations. In this way, very satisfactory check areas were maintained throughout the entire dusting period.

DUSTING OPERATIONS

Dusting operations were carried on when flying and air conditions were especially favourable for the most effective distribution of the fungicide. Successful aeroplane dusting can be done only when the air is calm, and its success is enhanced when there is sufficient moisture in the air to prevent excessive drifting of the finely divided fungicide.

In Western Canada, dusting wheat for the control of rust will probably always be carried on in the evening. The period from six to nine o'clock seems to be the most suitable for this work. When dusting operations were done at

this time, it was found that the manipulation of the machine and the distribution of the dust cloud was such as to give a uniform dust covering over a swath-width of 90 to 100 feet. On the prairies, early morning dusting operations were not satisfactory. Under extremely rare conditions only can satisfactory aeroplane dusting be carried out during the daytime. It is difficult to procure a uniform protective covering of sulphur dust, since excessive dust drifting occurs even if a wind velocity of 10 miles per hour prevails.

When the hopper valve is opened the dust is drawn out beneath the plane by the suction of air and is immediately caught in the "slip stream" and subjected to its influence. From the height of 10 to 20 feet it is forced down among the plants. The plane in flight is surrounded by a body of air, which, due to the movement of the machine and to the rotary motion of the propeller, follows a spiral course. The most effective and uniform distribution can be obtained when the dust is entirely under the control of the air movement set up by the plane. When the dust cloud is influenced by breezes, or the efficiency of its spread and coverage is reduced, careful observations have indicated that dust which drifts on to the standing crop affords it inadequate protection. In order to obtain the most effective dust covering, it is essential that the fungicide be applied forcibly to the growing plants.

DIRECTING DUSTING FLIGHT

To ensure the most thorough treatment of the crop, arrangements were made to direct the dusting flights from the ground. When dusting operations were in progress, one man was always in the grain field to direct the dusting operation.

The dusting area was distinctly marked out with large red flags. By means of white flags, the men on the ground could indicate to the pilot the path over which he was to traverse the field. After the machine had passed over he would move a sufficient distance across the field to allow for the most effective spread of the dust and then take up a position for the next crossing. In this way a uniform swath-width was maintained over the entire area treated. When the pilot left the field for reloading, the ground man would take up the new position so that he could give the pilot the direct line of flight for laying down the next dust-swath when the machine returned to distribute the new load.

EXPERIMENTAL DATA

The development of rust in the dusted and undusted portions of the fields under experiment was carefully observed during the dusting period. Dusting operations commenced on July 17, at which time only a light trace of stem rust could be found in the fields. Final rust data were taken a few days after each field had received its final application of dust, and shortly before the crop was harvested. Rust infection was estimated on the percentage basis and according to the usual standards.

Yield results were obtained by harvesting from the dusted and undusted portions of the field, not less than 20 rod rows being chosen at random throughout each area. The average of these samples was in calculating the yield of each area in bushels per acre. Threshed samples were submitted to Government Grain Grading Officials in Winnipeg, and were graded according to the Canadian Government standard.

EXPERIMENTAL RESULTS

The results obtained in each of the fields treated with sulphur dust are discussed separately in the following paragraphs:—

Morden A.—This field consisted of 1925 acres of Marquis wheat growing on summer-fallow. It was one mile long and was well adapted for aeroplane dusting flights. The field was divided into three sections. Areas approximately 200

feet wide were left between each section for buffer plots. One section of 45 acres received but one application of dust at the rate of 25 pounds per acre. Another section comprising 110 acres was dusted four times, at weekly intervals, at the same rate. The third section was left untreated as a check.

As is well known, there was but a slight development of rust in southern Manitoba. The results obtained show clearly that dusting had no marked effect on the percentage infection of stem rust. The result from the field dusted only once during the season does indicate the desirability of making more frequent dust applications for the most effective control of rust. However, where rust infection is so light and variable, it is very difficult to determine accurately small differences in the severity of the attack over such large areas.

In the section receiving four applications of dust, it was quite evident from field observations that rust was held in check in the treated area as compared to the untreated one. In this case, there was an increase in yield of six bushels per acre over the undusted check. It would be altogether unfair to consider that this increase was due entirely to reduced rust infection. Nevertheless, rust was significantly held in check in the treated plots. Part of this increase in yield might be accounted for by the control of other common leaf and stem diseases of wheat so prevalent in Manitoba this year. Careful observations indicate the value of sulphur against other diseases of wheat.

Morden B.—This dusted area received three 30-pound applications of sulphur per acre at intervals of seven days. Rust infection was extremely light over the dusted and undusted portions of the field. Again, there was an increased yield of six bushels per acre, but this might not be due entirely to reduced rust infection; the difference might be caused by the many factors operating in the absence of large amounts of stem rust. However, the increase in yield is significant and interesting, and was in all probability brought about by plant disease control.

Morris.—The field at Morris was divided into two sections. The treated section of 110 acres received three applications of sulphur weekly at the rate of 20 pounds per acre. There was almost a complete absence of injurious amounts of stem rust in the dusted and undusted areas. The yields obtained from these treated portions of the field did not show any significant increase over the undusted crop.

Graysville.—A thirty-acre field of wheat was sown on the farm of Mr. Alex Murray especially for dusting by horse-drawn, or self-propelled dusters. Extremely wet conditions in July prevented any treatment being made by means of ground machines. In order to protect the crop from damage by rust, it was deemed advisable to dust part of the field by aeroplane. Accordingly, 15 acres were dusted twice during the season. Sulphur dust was applied at the rate of 25 pounds per acre on July 19. Ten days later a similar treatment was made. Part of the same field remained untreated as a check. It is extremely interesting to notice the improvement in yield in the dusted area. Undoubtedly the increase of 7.7 bushels per acre over the undusted check is due mostly to the control of plant diseases. However, owing to the extremely light and variable rust attack in this district as in other parts of the province, the results cannot be interpreted as due entirely to the control of stem rust.

DISCUSSION

The past season in Manitoba, as far as rust development is concerned, was an exceptional one. It would be difficult to imagine more ideal conditions for the development and spread of rust than the conditions which prevailed during late June and early July. The amount of precipitation was unusually high and the weather over this period was moderately warm. However, a heavy rust epidemic did not occur.

It may be significant, as indicated by exposed spore trap records, that the relative absence of rust in Western Canada this year was correlated with the scarcity of early inoculum. The extremely patchy nature of heavily rusted spots in some districts did not indicate that conditions were favourable for rust development and that in all probability the absence of large quantities of early inoculum was a real factor in preventing a serious epidemic. However, in Manitoba, there was an almost complete absence of injurious amount of wheat stem rust. As far as observations could ascertain, the loss from stem rust was almost negligible.

Owing to the exceptionally light rust epidemic, the aeroplane dusting experiments were obviously of no great value in determining the fundamental question of what rates and frequencies of dust will effect the practical control of rust. It will require more significant results to indicate the limits of effectiveness of the treatment, as well as the economic and practical possibilities of aeroplane dusting. Such results can only be expected when fairly heavy rust epidemics occur. However, the results, as noted above do indicate the effectiveness of this method of sulphur dusting.

As far as the yield results are concerned, any difference in yield between dusted and undusted fields in a given district may be due to many factors operating in the absence of significant amounts of stem rust. Nevertheless, the increase in yield is interesting, and from close observations, it would be seen that the difference in yield between the dusted and undusted portions of the same field can be accounted for by the general effectiveness of sulphur in controlling rust of wheat and other common stem and leaf diseases. This is an extremely important point in favour of sulphur dusting. It will be noticed that in practically every case there was a decided increase in yield in favour of the dusted crop. However, as rust epidemics do not occur every year, and as the results of several years of heavy rust infestation are necessary before a dusting program can be laid down, it will be necessary to continue the experimental work until a definite schedule can be proposed.

From all the results it is evident that this method has distinct practical possibilities. Experiments have shown that the aeroplane is well suited for dusting large acreages. It is extremely desirable to determine what constitutes practical, as opposed to absolute, control of rust, in order that the most economical system of dusting may be determined. The problem is one of tremendous economic importance and should be given every attention, for the results thoroughly justify the continuance of this important phase of rust research work. Not only can rust be controlled, but even in the absence of severe rust infection, the beneficial effects of dusting are evident.

APPENDIX "E"

REGISTER OF AIRCRAFT

The following is a complete record of the aircraft operated by State, Private and Commercial owners during the year 1928. Explanatory notes will be found at the foot of each page for firms and aircraft marked with an asterisk.

Name and Address	Registration Markings	Type of Aircraft	Purpose
Col. C. H. Ackerman, Peterborough, Ont.	G-CATZ	D.H. 60X Moth.	Private
Aeronautic Association of Canada, Ltd., 505-530 Bay St., Toronto, Ont.	G-CAVF	D.H. 60X Moth.	Commercial
Aircraft Limited, 2498 Yonge St., Toronto, Ont.	G-CAJV	D.H. 60 X Moth.	"
"	G-CAUC	"	"
"	†G-CAUN	"	"
Anderson Bros., 121-125, 7th Ave. E., Calgary, Alta.	G-CAHU	Standard J. 1.	"
Auburn Motor Sales, Ltd., Bay-Bloor Sts., Toronto, Ont.	G-CAVI	D.H. 60X Moth.	"
J. B. & W. L. Badgley, Lake of the Woods Bldg., Montreal, P.Q.	G-CARW	D.H. 60X Moth.	Private
L. Beaudoin, Montreal Loan & Investment Co., 86 Notre Dame St. W., Montreal, P.Q.	G-CAVJ	D.H. 60X Moth.	"
A. Beilby, Stalwart, Sask.	G-CÁAL	Curtiss J.N. 4.	"
T. G. Blakely, 130 Princess St., Winnipeg, Man.	G-CAWE	Waco Ten.	Commercial
Bowring Bros., St. Johns, Nfld.	G-CAWI	Avro Avian.	Private
B.C. Airways Ltd., 900, 2 Fort St., Victoria, B.C.	G-CAIR	Driggs Dart.	Commercial
"	†G-CATX	Ford Trimotor.	"
"	G-CATN	Combination Wing Eaglerock.	"
"	G-CAIS	"	"
Brock & Weymouth of Canada, Ltd., 120 St. James St., Montreal, P.Q.	G-CAWH	Fairchild F.C. 2.	"
*Canadian Air Express Ltd., Bank of Hamilton Bldg., Toronto, Ont.	G-CATI	D.H. 60X Moth.	"
"	G-CATF	"	"
Canadian Airways Ltd., 190 St. James St., Montreal, P.Q.	G-CANB	Fairchild F.C. 2.	"
"	G-CANC	"	"
"	G-CAHQ	H.S. 2 L. Flying Boat.	"
"	G-CAGT	"	"
"	G-CANZ	"	"
"	G-CARL	"	"
"	G-CÁRO	"	"
*Canadian Air Services, Peterboro, Ont.	G-CAHP	J.N. 4 D.	"
*Canadian Air Transport, 47 Third Ave., Ottawa, Ont.	†G-CARB	Long Wing Eaglerock.	"
Canadian Colonial Airways, Ltd., Mount Royal Hotel Bldg., Montreal, P.Q.	G-CAVL	Fairchild F.C. 2 W. 2.	"
"	G-CAVN	"	"
Canadian Transcontinental Airways Ltd., 111 Cote de la Montagne, Que., Que.	G-CAIP	Fairchild F.C. 2 W. 2.	"
"	G-CAIQ	"	"
"	G-CAIW	"	"
"	G-CART	"	"
"	G-CARQ	Loening Amphibian.	"
"	G-CARS	"	"
"	G-CARR	Stearman C. 3 B.	"
Canadian Vickers, Ltd., P.O. Box 550, Montreal, P.Q.	G-CATT	Fairchild F.C. 2.	"
"	G-CATU	"	"
"	G-CATV	"	"
"	G-CATW	"	"
"	G-CAUT	Vickers Vedette.	"

†Aircraft withdrawn from use.

*Ceased operations.

Name and Address	Registration Markings	Type of Aircraft	Purpose
Department of National Defence, Ottawa, Ont., on loan to— <i>Con.</i>			
London.....	G—CAKY	D.H. 60X Moth.....	Club instruction
".....	G—CALC	" ".....	"
Border Cities.....	G—CAKF	" ".....	"
".....	G—CAUQ	" ".....	"
Winnipeg.....	G—CAKU	" ".....	"
".....	G—CAKB	" ".....	"
Regina.....	G—CAKP	" ".....	"
".....	G—CAKT	" ".....	"
Moose Jaw.....	G—CAKV	" ".....	"
".....	†G—CAKI	" ".....	"
Saskatoon.....	G—CAKG	" ".....	"
".....	G—CAKO	" ".....	"
Calgary.....	G—CALA	" ".....	"
".....	G—CAKQ	" ".....	"
Edmonton.....	G—CAKJ	" ".....	"
".....	G—CALB	" ".....	"
Victoria.....	G—CAKA	" ".....	"
Vancouver.....	G—CAKW	" ".....	"
".....	G—CAKH	" ".....	"
Eastern Canada Airways, Ltd., 1006 Excelsior Life Bldg., Toronto, Ont.	G—CAJK	Ryan M. 2.....	Private
*C. Evans, 511 Lauder Ave., Toronto, Ont.	G—CANR	Standard J. 1.....	Commercial
Fairchild Aviation Ltd., Grand Mere, P.Q.	G—CAEG	Curtis Experimental.....	"
".....	§G—CAEK	Keystone Puffer.....	"
".....	G—CAGC	Fairchild F.C. 2.....	"
".....	G—CAHL	" ".....	"
".....	G—CAIH	" ".....	"
".....	G—CANF	" ".....	"
".....	G—CATA	" ".....	"
".....	G—CAVR	" " W. 2.....	"
"..... (Temporary)	G—CAFD	Aeromarine.....	"
J. C. Folkins, Woodstock, N.B.	G—CANT	Standard J. 1.....	Private
General Airways Ltd., 97 Garfield Ave., Toronto, Ont.	G—CATJ	D.H. 60X Moth.....	Commercial
".....	G—CAJJ	Fairchild F.C. 2.....	"
Gillies Air Service, 72-74 Queen St. S., London, Ont.	G—CAHV	Waco Nine.....	"
Great Western Airways, Limited, 218, 11th Ave. W., Calgary, Alta.	G—CANI	Stinson Detroiter S.B. 1.....	"
".....	G—CARY	D.H. 60X Moth.....	"
".....	G—CARX	" ".....	"
*E. V. Hemple (Temporary), 33 Goyeau St., Windsor, Ont.	G—CAVE	Martin.....	"
*F. W. Hodges, c/o Hagaman, Oak- ville, Ont.	G—CAEX	Curtis Canuck.....	"
W. K. Hogg & G. H. Trenholme, 371 St. Joseph St., Lachine, P.Q.	G—CATH	D.H. 60X Moth.....	Private
J. H. Holley, Ste 9, Kenilworth Court, Hargrave St., Winnipeg, Man.	G—CANO	Avro Avian.....	Commercial
International Airways of Canada, Ltd., Hamilton, Ont.	G—CAEL	Norman Thompson.....	"
".....	G—CAEX	Curtiss Canuck.....	"
".....	†G—CAFX	" ".....	"
".....	†G—CAFS	" ".....	"
".....	G—CAFV	" ".....	"
".....	G—CAFY	" ".....	"
".....	†G—CAIJ	" ".....	"
".....	G—CAJA	" ".....	"
".....	G—CANY	" J.N. 4.....	"
".....	G—CAIT	Swallow.....	"
".....	†G—CANG	" ".....	"
".....	G—CANH	" ".....	"
".....	G—CANU	" ".....	"
".....	G—CANV	" ".....	"
".....	G—CASB	" ".....	"
".....	G—CAUJ	" ".....	"
".....	G—CAUK	" ".....	"
"..... (Temporary)	G—CATR	Fairchild F.C. 2.....	"
".....	†G—CARN	Loening Amphibian.....	"

§Aircraft withdrawn from use. Sank at moorings.

†Aircraft withdrawn from use. Destroyed by fire.

*Ceased operations.

†Aircraft withdrawn from use.

APPENDIX "F"

COMMERCIAL AIR PILOTS ENGAGED IN AVIATION IN CANADA, 1928

Name	Address	Employed by
Abbott, G. S.		Civil Aviation Branch.
Ahr, E. W.	167 Pim St., Sault Ste. Marie, Ont.	
Ambrose, F. J.		Canadian Colonial Airways.
Ashton, M. E.	129 Garfield Ave., London, Ont.	
Atkinson, E. D. S.		Western Canada Airways, Ltd.
Ayres, H. P.		Canadian Transcontinental Airways.
Banghart, F. I.	12 Bellevue Ave., London, Ont.	
Baragar, F. B.	93 Lansdowne Ave., Winnipeg, Man.	
Bartlett, J. N.	502 Beresford Ave., Winnipeg, Man.	
Bath, C. L.		Dartmouth Air Station.
Baxter, W. E.	635, 13A West, Vancouver, B.C.	
Becker, Chas.	11024, 89th Ave., Edmonton, Alta.	
Berry, A. M.	368 Bronson Ave., Ottawa, Ont.	
Berry, G. K.	51 Woodbine Crescent, Hamilton, Ont.	
Bertrand, J. G.	P.O. Box 1449, Portage la Prairie, Man.	
Bibby, R. H.		Skyview Lines.
Blicquy, Michael.		Winnipeg Flying Club.
Bondurant, D. S.		International Airways, Ltd.
Bourgeois, R. P.		Compagnie Aerienne Franco Canadienne.
Boyd, J. L.		International Airways, Ltd.
Boyd, J. W.	1617, 5th Ave W., Owen Sound, Ont.	
Bradfield, F. M.		Canadian Transcontinental Airways, Ltd.
Brintnell, W. L.		Western Canada Airways, Ltd.
Broatch, B. W.		Dominion Explorers, Ltd.
Brown, F. R.	7 Beresford Apts., Beresford and Osborn Sts., Winnipeg, Man.	
Brown, W. G.	Harris, Sask.	
Bruce, A. E. T.	Yarmouth Heights, St. Thomas, Ont.	
Buchanan, W. J.		Western Canada Airways, Ltd.
Burge, G. R.	Haileybury, Ont.	
Burke, T. W. L.	Suite No. 4, Empire Apts., Moose Jaw, Sask.	
Burley, H. G.	32 Chudleigh Ave., Toronto, Ont.	
Burt, A. E.	101 Elgin St., Hamilton, Ont.	
Burton, E. C.	75 Roselawn Ave., Toronto, Ont.	
Bythell, J. F.		Saskatoon Aero Club.
Blakeley, T. G.	130 Princess St., Winnipeg, Man.	
Calder, P. B.	P.O. Box 4157, Edmonton S., Alta.	
Caldwell, C. S.		Canadian Vickers, Ltd.
Cameron, C. H.	Prince Rupert, B.C.	
Capreol, E. L.		DeHavilland Aircraft of Canada, Ltd.
Carberry, J. E.		Nyeri Kenya Colony, Africa.
Carruthers, D.		Western Canada Airways, Ltd.
Carter, A. W.		Victoria Flying Club.
Champagne, E. O.	2873 Holt Ave., Rosemount, Montreal, P.Q.	
Cheesman, S. A.		Northern Aerial Minerals Exploration, Ltd.
Clarke, J. M.		Canadian Airways, Ltd.
Clarke, W. H.	Box 128, Oshawa, Ont.	
Clegg, H. R.		International Airways, Ltd.
Colley, A. K.	56 Prince Prince Arthur St., Toronto, Ont.	
Compton, J. H.	Room 448, Y.M.C.A., Drummond St., Montreal, P.Q.	

COMMERCIAL AIR PILOTS ENGAGED IN AVIATION IN CANADA, 1928—Continued

Name	Address	Employed by
Coombs, C. B.		International Airways, Ltd.
Cooper, E. J.		Canadian Transcontinental Airways, Ltd.
Crang, J. G.	156 Oakwood Ave., Toronto, Ont.	
Crossley, C. C.	King, Ont.	
Crosson, J. E.		Western Canada Airways, Ltd.
Crowson, A. A.	19 Dundonald St., Toronto, Ont.	
Cruickshank, A. D.		Western Canada Airways, Ltd.
Cumming, Wm. N.		
Cury, R. L. E.		Compagnie Aerienne Franco Canadienne.
Davis, E. F. H.		Duncan Motor Co.
Dawson, F. J.		Ontario Provincial Air Service.
Dean, G. W.		Fairchild Aviation, Ltd.
Delhaye, R. A.	2321 Lorne St., Regina, Sask.	
Dickins, C. H.		Western Canada Airways, Ltd.
Dingwall, G. C.	24 Brummell Ave., Toronto, Ont.	
Dobbin, E. C. W.	1303 Vancouver Block, Vancouver, B.C.	
Dodds, R.		Hamilton Flying Club.
Dougall, W.		High River Air Station.
Drury, W. H. E.	162 Ontario St., St. Catharines, Ont.	
Eckardt, G. D.	315 Kendal Ave., Toronto, Ont.	
Elliot, J. V.	P.O. Box 275, Hamilton, Ont.	
Emery, W. M.	32 Belmont Ave., Ottawa, Ont.	
Evans, Chris.		Granby Aero Club.
Farrell, C. M. G.	Ste 12, Van Sittart Block, Winnipeg, Man.	
Farrington, A. H.		Western Canada Airways, Ltd.
Finkle, H. W.	47 Third Ave., Ottawa, Ont.	
Fitton, T. G.	Richmond Hotel, London, Ont.	
Fleming, W.	Crossfield, Alta.	
Foley, H. C.		Winnipeg Air Station.
Folkins, J. C.	Woodstock, N.B.	
Foss, R. H.	77 Staynor Ave., Westmount, P.Q.	
Fowler, W. W.	P.O. Box 271, Sackville, N.B.	
Francisco, Wm. H.	16 Lexington Ave., Jersey City, N.J., U.S.A.	
Garratt, P. C.	79 Adelaide St. E., Toronto, Ont.	
Garten, P. A.		Western Canada Airways, Ltd.
Gibbons, O. A. C.	63 St. Albans St., Halifax, N.S.	
Gilbert, W. E.	Cardinal, Ont.	
Gillies, F. F.	28 Lydia St., Kitchener, Ont.	
Golds, A. E.		R.C.A.F. Station, Camp Borden.
Graham, Stuart		Civil Aviation Branch.
Grant, J. L.	6875 St. Valier St., Montreal, P.Q.	
Gray, H. E.		Sky View Lines, Ltd.
Groome, R. J.		Regina Flying Club.
Guest, R. Carter		Toronto Flying Club.
Hand, E. M.	14 Anderson Ave., Toronto, Ont.	
Hardy, A. C.	St. Hubert, P.Q.	Civil Aviation Branch.
Hartwick, F. W.	149 Glendale Ave., North Hamilton, Ont.	
Harvey, A.		Ontario Provincial Air Service.
Heaven, A. C.		
Hicks, G. R.		International Airways, Ltd.
Hilchie, W.	Weston, Ont.	
Hill, S. L.	Easterhazy, Sask.	
Holland, Wm. J.	Cobalt, Ont.	
Holley, J. H.	Sta. 9, Kenilworth Court, Hargrave St., Winnipeg, Man.	
Hollick-Kenyon, H.		Western Canada Airways, Ltd.
Holmes, G. B.		Ontario Provincial Air Service.
Home-Hay, J. B.	401 McCallum Bldg., Regina, Sask.	
Horsley, R. S.		International Airways, Ltd.
Houghton, E. O.	38 Beaufort Rd., Toronto, Ont.	
Hughes, W. A.		Canadian Colonial Airways, Ltd.
Ingram, A. F.		R.C.A.F. Station, Camp Borden.
Ingram, H. C.		Civil Aviation Branch.
Irvine, W. H.	86 Carleton St., Fredericton, N.B.	
Janney, E. L.	36 King St. E., Toronto, Ont.	

COMMERCIAL AIR PILOTS ENGAGED IN AVIATION IN CANADA, 1928—Continued

Name	Address	Employed by
Jarvis, A. E. de M.		Ontario Provincial Air Service.
Jerrery, C. N. F., Jr.		Western Canada Airways, Ltd.
Jeffries, E. C. N.		Fairchild Aviation, Ltd.
Jellison, J. E.		Ottawa Air Station.
Johnson, F. E.	Box 239, Kindersley, Sask.	
Johnston, W. J. E.	228 Glenrose Ave., Toronto, Ont.	
Jones, E. D.	27 Staynor Ave., Montreal, P.Q.	
Jones, M. E.	800 Wilson Ave., Montreal, P.Q.	
Joy, D. G.		Aircraft Limited.
Judd, J. H.		Ontario Provincial Air Service.
Kane, A. L. A.	71 King St., Halifax, N.S.	
Keeler, R. E.		Sky View Lines, Ltd.
King, F. C.	183 Erskine Ave., Toronto, Ont.	
King, C. W.	584 Princess St., Woodstock, Ont.	
Kingsborough, J.	Coldwater, Ont.	
Kraigher, Geo.	1607 Walnut St., Philadelphia, Pa., U.S.A.	
Langford, H. H.	725 St. Claire Ave. W., Toronto, Ont.	
Lawson, Murray	c/o H. C. Hagaman, Oakville, Ont.	
Lawson, W. S.	37 Tisdale St. S., Hamilton, Ont.	
Leach, J. O.		Sky View Lines, Ltd.
Leavens, A. D.	R.R. No. 4, Belleville, Ont.	
Leavens, W. T.	R.R. No. 4, Belleville, Ont.	
Lewis, P. G.	39 Hillside Ave., Westmount, P.Q.	
Lighthall, W. S.	1822 Queen Mary Rd., Montreal, P.Q.	
Luke, E. C.		Western Canada Airways, Ltd.
Lyons, W. H.	286 John St., Sault Ste. Marie, Ont.	
MacDougall, W. H.	Colborne, Ont.	
MacKay, E. S.	New Glasgow, N.S.	
MacLaren, D. R.	2988, 41st Ave. W., Vancouver, B.C.	
MacPherson, E. G.	2033 Athol St., Regina, Sask.	
Malone, Alva	Saskatoon, Sask.	
Maltby, A. S.	Apt. 2, 305 Kendall Ave., Toronto, Ont.	
Mattern, Le R.	Suite 40, Le Marchand Apts., 116th St., Edmonton, Alta.	
Maxwell, W. R.		Ontario Provincial Air Service.
May, W. R.		Edmonton Flying Club.
Maynard, L. E.		Ottawa Flying Club.
Millar, Wm. N.	35 Lafayette Ave., Peterborough, Ont.	
Monville, Albert		Compagnie Aerienne Franco Canadienne.
Moore, B. A.	1515, 18th St., Detroit, Mich., U.S.A.	
Morgan, M. P.	604 Bloomfield Rd., Sandwich, Ont.	
McCall, F. R.	1711, 10th St. W., Calgary, Alta.	
McCardell, W. H.		Calgary Aero Club.
McCarthy, F. W.	748 Huron St., Toronto, Ont.	
McConnell, R. K.	80 Dawlish Ave., Toronto, Ont.	
McDonough, W. J.		Northern Aerial Minerals Exploration Co.
McIntyre, D. A.		Ontario Provincial Air Service.
McLeod, W. A.	396 Lauder Ave., Toronto, Ont.	
McLean, A. D.		Civil Aviation Branch.
Nicoll, R. E.		Ontario Provincial Air Service.
Oaks, H. A.		Northern Aerial Minerals Exploration Co.
O'Brien, G. S.	265 Roxboro St. E., Toronto, Ont.	
O'Brien-Saint, J. T.		R.C.A.F. Station, Camp Borden, Ont.
Overbury, R. F.		Ontario Provincial Air Service.
Page, W. S.	630 Victoria Ave., Westmount, P.Q.	
Palmer, J. E.	1235, 5th Ave., A. South, Lethbridge, Alta.	
Parkinson, J. D.		International Airways, Ltd.
Pasmore, H. M.		Fairchild Aviation, Ltd.
Patterson, J. M.	Whitehorse, Y.T.	
Patriarche, V. H.	22B Guelph Apts., Winnipeg, Man.	

COMMERCIAL AIR PILOTS ENGAGED IN AVIATION IN CANADA, 1928—*Continued*

Name	Address	Employed by
Peacock, E. F.....	1435 Queen Mary Rd., Montreal, P.Q.	
Peart, G. L.....	166 Grenadier Rd., Toronto, Ont.	
Peel, Robert.....	Sub P.O., Ottawa St., Ford, Ont.	
Peterson, R. R.....	43 Fairmont Ave., Hamilton, Ont.	
Phillips, G. H.....		Ontario Provincial Air Service.
Pickles, Sydney.....		Victoria Flying Club.
Pilkington, C.....	1011 Springfield Ave., Hill, Sum- mit, N.J., U.S.A.	
Plamont, R.....		Compagnie Aerienne Franco Canadienne.
Pliske, B.....	148 Marlborough Ave., Ottawa, Ont.	
Pomey, P.....		Compagnie Aerienne Franco Canadienne.
Preston, G. D.....	219 Balsam Ave. S., Hamilton, Ont.	
Ptolemy, W. H.....		Ontario Provincial Air Service.
Pudney, W. G.....		R.C.A.F. Station, Camp Borden, Ont.
Pugnetti, M. J.....		Compagnie Aerienne Franco Canadienne.
Quigley, H. S.....	3504 Park Ave., Montreal, P.Q.	
Raney, A. J.....	30 Colborne St., Kingston, Ont.	
Reeder, P.E.....		Canadian Colonial Airways, Ltd.
Reid, T. M.....		Northern Aerial Minerals Exploration, Ltd.
Reid, J. H.....		Halifax Aero Club.
Rice, C. M.....	460 Grosvenor Ave., Westmount, P.Q.	
Robertson, C. T.....		Canadian Colonial Airways, Ltd.
Robertson, J. R.....		Canadian Airways, Ltd.
Ronald, B. R.....	76 Lombard Ave., Winnipeg, Man.	
Ross, J. R.....		Patricia Airways, Ltd.
Rowland, D. E.....		Canadian Colonial Airways, Ltd.
Russell, F. J.....		Western Canada Airways, Ltd.
Rutledge, W. L.....		Calgary Aero Club.
Ryan, R. W.....	1137 Redland Ave., Moose Jaw, Sask.	
Sanderson, W. J.....		London Flying Club.
Sands, H. R.....	318 Kennedy St., Winnipeg, Man.	
Saunders, K. F.....		Fairchild Aviation, Ltd.
Schade, H. A.....		Western Canada Airways, Ltd.
Schiller, C. A.....		Northern Aerial Minerals Exploration, Ltd.
Schneider, A. L. W.....	1078 Stanley St., Montreal, P.Q.	
Shaw, B. H.....	146 E. 349th St., New York City, U.S.A.	
Shaylor, W. F.....		R.C.A.F. Station, Camp Borden, Ont.
Shute, F. F.....		International Airways of Canada, Ltd.
Simoneau, H.....	8143 St. Andre St., Montreal, P.Q.	
Smith, H. C. W.....		Canadian Airways, Ltd.
Smith, R. K.....	1607 Walnut St., Philadelphia, Pa., U.S.A.	
Soundy, R. H.....		Border Cities Aero Club.
Sparks, F. G. M.....		Montreal Light Aeroplane Club.
Spence, W. A.....	Jordan River, B.C.	
Spooner, H.....		Montreal Light Aeroplane Club.
Stanton, S. T.....	4284 Allendale Ave., Detroit, Mich., U.S.A.	
Stephens, T. G. M.....		Treadwell Yukon, Ltd.
Stevens, N. E.....	2134, 17th Ave. W., Calgary, Alta.	
St. Martin, J. H.....	1278 St. Matthew St., Montreal, P.Q.	
Straith, W. P. A.....	211 Maryland St., Winnipeg, Man.	
Stull, E. W.....		Ontario Provincial Air Service.
Sutton, Chas.....	Sioux Lookout, Ont.	
Swartman, G.....	Waubauskene, Ont.	
Templeton, A.....		London Air Transport, Ltd.
Thompson, G. A.....		Western Canada Airways, Ltd.
Thomson, N. A.....	136 William St. N., Chatham, Ont.	
Towns, C. V.....	175 Sandford Ave. S., Hamilton, Ont.	

COMMERCIAL AIR PILOTS ENGAGED IN AVIATION IN CANADA, 1928—*Concluded*

Name	Address	Employed by
Trim, G. K.....	2050 Bleury St., Montreal, P.Q.	
Tripp, L. J.....	207 Balsam St. S., Hamilton, Ont.	
Troup, C. R.....		Fairchild Aviation, Ltd.
Trussler, G. E.....	239 Lachlie St., Orillia, Ont.	
Turnbull, A. J.....	1942 Retalic St., Regina, Sask.	
Tweed, Wm. W.....		International Airways, Ltd.
Upham, A. C.....		Western Canada Airways, Ltd.
Upson, G. C.....	5425 Wellington St., Verdun, P.Q.	
Vachon, I.....		Canadian Transcontinental Airways.
Vachon, R.....		" " "
Vance, J. D.....	31 Manor Rd., Toronto, Ont.	
Wakeman, G. G.....		Civil Aviation Branch.
Wallace, O. C. S.....	14 Dufferin Rd., Hamsted, Montreal, P.Q.	
Wardle, H. D.....		Fairchild Aviation, Ltd.
Watt, H.....	112 Fairlawn Ave., Toronto, Ont.	
Weatherdon, E.....	53 Bertha Place, Tompkinsville, Staten Island, N.Y., U.S.A.	
Westergaard, A. N.....	Box 502, Macoun, Sask.	
Whyte, K. E.....	Grimsby, Ont.	
Williams, T. F.....	R.R. No. 1, Woodstock, Ont.	
Williamson, J. L.....	11 St. Andrew Ave., Centre Island, Toronto, Ont.	
Wilson, A. H.....	Royal Oak, Victoria, B.C.	
Wright, A. E.....	26 Selby St., Westmount, P.Q.	
Yonge, T. A.....		Ottawa Air Station.
Younger, G. A.....	51½ Ann St., Toronto, Ont.	

APPENDIX "G"

AIR ENGINEERS ENGAGED IN AVIATION, 1928

Name	Address	Employed by
Adams, A. G. W.		Canadian Transcontinental Airways, Ltd.
Ahr, Edward W.		Ontario Provincial Air Service.
Alton, E. A.	482 Gertrude Ave., Winnipeg, Man.	
Ambrose, F. J.		International Airways of Canada, Ltd.
Atkinson, D. S.		Western Canada Airways, Ltd.
Ayres, H. P.	Peterboro, Ont.	
Bain, H. J. B.		Ontario Provincial Air Service.
Baker, R. S.		General Airways, Ltd.
Banghart, F. I.	12 Bellevue Ave., London, Ont.	
Banting, C. S.		Moose Jaw Flying Club.
Berry, G. K.		International Airways of Canada, Ltd.
Biggar, P. E.	54 Jurors St., Montreal, P.Q.	
Billington, Eric.		Ontario Provincial Air Service.
Blicquy, M. A.		Canadian Air Services.
Bondurant, D. S.		Canadian Airways, Ltd.
Bonne, W. C.		Canadian Airways, Ltd.
Briggs, L. H.		Ontario Provincial Air Service.
Brintnell, W. L.		Western Canada Airways, Ltd.
Brookes, Harold		Canadian Aircraft Co., Ltd.
Burchall, W. B.		Western Canada Airways, Ltd.
Buge, G. R.		Prospectors Airways, Ltd.
Burrows, M. F.	220 Manor Rd. E., Toronto, Ont.	
Burton, E. C.	75 Roselawn Ave., Toronto, Ont.	
Caddick, Thos.		Northern Aerial Minerals Exploration, Ltd.
Caldwell, C. S.		Bowring Bros.
Caldwell, W. B.		International Airways of Canada, Ltd.
Carter, A. W.	330 Dennison Rd., Victoria, B.C.	
Cartier, G.		Canadian Transcontinental Airways, Ltd.
Chapman, Wm. Geo.		Sky View Lines, Ltd.
Cheesman, S. A.		Northern Aerial Minerals Exploration, Ltd.
Clark, Jac MacD.		Canadian Transcontinental Airways, Ltd.
Clearwater, O. H.	The Pas, Man.	
Clement, J. M. B.	23 Empress Ave., Ottawa, Ont.	
Cooper, T. F.	231 Roseberry St., St. James, Winnipeg, Man.	
Coombs, C. B.		International Airways of Canada, Ltd.
Coupland, R. W.		Canadian Colonial Airways, Ltd.
Cressy, T. H.	712 Vancouver St., Victoria, B.C.	
Crossley, C. C.	King, Ont.	
Cruikshank, A. D.		Western Canada Airways, Ltd.
Davenport, H. E.		Western Canada Airways, Ltd.
Davis, P. L.	P.O. Box 72, Dewdney, B.C.	
Davis, E. P. H.		Duncan Motor Co.
Dawson, E. D.		R.C.A.F. Headquarters, Ottawa, Ont.
Demas, E. J.	1906 Irving St. N.E., Washington, D.C., U.S.A.	
Detlefsen, F. R.	2112 Albert St., Regina, Sask.	
Dewhurst, H. T.	2892 Lafontaine East, Montreal (Maisonneuve), P.Q.	
Dickins, C. H.		Western Canada Airways, Ltd.
Doan, G. A.		" " " "
Dobbin, E. C. W.		Dominion Airways, Ltd.
Dobbin, C. R.		" " " "
Dodds, Robert	1029 Main St. E., Hamilton, Ont.	
Douglass, J. R. C.		Reid Aircraft Co.
Elliot, J. V.	Box 195, Hamilton, Ont.	
Emery, W. M.	210 Queen St., Ottawa, Ont.	
Evans, Chris.	511 Lauder Ave., Toronto, Ont.	
Fabre, P.		Compagnie Aerienne Franco Canadienne.
Failes, L. R.		Ontario Provincial Air Service.
Farrington, A. H.		Western Canada Airways, Ltd.
Felson, P.		Northern Aerial Minerals Exploration Ltd.

AIR ENGINEERS ENGAGED IN AVIATION, 1928—Continued

Name	Address	Employed by
Lyons, W. H.		Ontario Provincial Air Service.
Macauley, S.		" " "
MacMaster, J. H.	Vingolf Apts., Agnes St., Winnipeg, Man.	
May, W. R.		Commercial Airways, Ltd.
Malone, Alva.		Cherry Airways, Ltd.
Milenkovitch, S.		Compagnie Aerienne Franco Canadienne.
Millar, W. N.	35 Lafayette Ave., Peterboro, Ont.	
Miller, H. B.		International Airways of Canada, Ltd.
Maloney, P. J.		Ontario Provincial Air Service.
McAnespie, Harry.	254B Rushbrooke St., Verdun, P.Q.	
McClellan, H. F.		Canadian Airways, Ltd.
McConnell, B.		Elliott Air Service.
McCracken, Thos.		Aircraft, Ltd.
McCulloch, J. A.	559 Wm. David St., Montreal, P.Q.	
McCurdy, A. H.		Western Canada Airways, Ltd.
McGeorge, J.		" " "
Nadin, W. B.		" " "
Nelson, J. C.	257 Milverton Blvd., Toronto, Ont.	
O'Connor, B. M.	231 Young St., Winnipeg, Man.	
Palmer, J. E.		Great Western Airways, Ltd.
Parmenter, L. W.		Western Canada Airways, Ltd.
Pasmore, H. M.		Fairchild Aviation, Ltd.
Patterson, J. M.		Yukon Airways and Exploration Co., Ltd.
Peel, R.	17 Riverside Drive, Ford, Ont.	
Pickles, S.	378 Newport Ave., Oak Bay, Victoria, B.C.	
Plant, C.	Thurston Bay, Sonora Id., B.C.	
Pooley, F.		Ontario Provincial Air Service.
Power, L. H.	1219 Sussex Ave., Montreal, P.Q.	
Preston, G. D.		International Airways of Canada, Ltd.
Quigley, H. S.	3504 Park Ave., Montreal, P.Q.	
Reece, J. M.	Bank of Montreal, Vancouver, B.C.	
Riley, Wm.	149 Pine St., Sault Ste. Marie, Ont.	
Roach, A.		Western Canada Airways, Ltd.
Robertson, J. R.	56 Maitland St., Toronto, Ont.	
Robins, A. C.		DeHavilland Aircraft of Canada, Ltd.
Robinson, F. V.	1004 Royal Bank Bldg., Toronto 2, Ont.	
Ronald, B. R.	119 Ferry Rd., St. James, Man.	
Ross, J. R.	775 North Drive, Fort Garry, Winnipeg, Man.	
Rouffaer, J.	203 Spence St., Winnipeg, Man.	
Rouse, S. A.		London Flying Club.
Ruse, J. C.	Long Branch P.O., Ont.	
Rutledge, W. L.	Cranbrook, B.C.	
Saunders, K. F.		Fairchild Aviation, Ltd.
Scott, H.	13 Cameron Ave., Windsor, Ont.	
Schiller, C. A.		Northern Aerial Minerals Exploration, Ltd.
Shawyer, G. R.		J. H. Holley.
Sherborne, John.		Ontario Provincial Air Service.
Siers, T. W.		Western Canada Airways, Ltd.
Simard, H.		Ontario Provincial Air Service.
Simard, J. E. R.		" " "
Simoneau, H.		Montreal Flying Club, Inc.
Sinclair, S. M.		Leavens Bros. Air Service.
Smith, Philip.	74 Clyde St., Hamilton, Ont.	
Stephens, T. G. M.		Yukon Airways and Exploration Co., Ltd.
St. Martin, J. H.		Continental Aero Corp., Ltd.
Sraith, W. P. A.		Canadian Aircraft Co.
Stull, E. W.		Western Canada Airways, Ltd.
Suddes, A. S.	3722 Jeanne Mance, Montreal, P.Q.	
Sutton, Chas.		Dominion Exploration Co., Ltd.
Swanson, A.		St. Hubert Airport.
Talbot, F.	362 Parliament St., Toronto, Ont.	

AIR ENGINEERS ENGAGED IN AVIATION, 1928—Continued

Name	Address	Employed by
Fergie, A. R.	Cap-de-la-Madeleine, P.Q.	
Ferguson, C. J.	1418 Vimont St., Maisonneuve, P.Q.	
Ficke, Geo.		Canadian Airways, Ltd.
Field, W.		Western Canada Airways, Ltd.
Finnigan, Jos.		Canadian Airways, Ltd.
Fitzsimmons, H. H.	1234, 7th Ave. S., Lethbridge, Alta.	
Fitton, T. G.	Richmond Hotel, London, Ont.	
Fleming, Walter		Elliot Air Service.
Foley, H. C.		R.C.A.F. non-permanent.
Folkins, J. C.	Woodstock, N.B.	
Ford, R. H.		Commercial Airways, Ltd.
Forrest, C. N.		Western Canada Airways, Ltd.
Francis, H. Wm.		Fairchild Aviation, Ltd.
Franklin, H. M.	517 River St. E., Prince Albert, Sask.	
Fraser, R. H.		Ontario Provincial Air Service.
Galloway, G. C.	201 Carlton St., Winnipeg, Man.	
Gill, Geo.		Ontario Provincial Air Service.
Gillies, F. F.		Gillies Air Service.
Goodwin, A. D.		Western Canada Airways, Ltd.
Goold, J. E.	536 Vimont St., Maisonneuve, Montreal, P.Q.	
Govett, S.	General Post Office, Vancouver, B.C.	
Grant, J. L.	6875 St. Valier St., Montreal, P.Q.	
Green, C. H.	234 Bain Ave., Toronto, Ont.	
Green, A. S.	Armdale, Halifax Co., N.S.	
Gregson, W. J. W.		Canadian Transcontinental Airways, Ltd.
Groome, R. J.		Universal Air Industries, Ltd.
Grove, F. G.	506 Cannon St. E., Hamilton, Ont.	
Hacull, S.		DeHavilland Aircraft of Canada, Ltd.
Hainstock, P. A.		Dominion Airways, Ltd.
Handford, Percy		Edmonton and Northern Alberta Aero Club.
Hardy, A. C.		(Manager) St. Hubert Airport.
Harrop, B. N.		Consolidated Mining and Smelting Co., Ltd.
Hartwick, F. W.	149 Glendale Ave., Hamilton, Ont.	
Harvey, Alex.	77 Selby St., Montreal, P.Q.	
Hendry, R.		Patricia Airways, Ltd.
Hill, W. J.		Imperial Oil Co., Ltd.
Hodgins, R. H.		Western Canada Airways, Ltd.
Home-Hay, J. B.		Commercial Airways, Ltd.
Horsley, R. S.		Elliot Air Service.
Hoskin, G. H.		Anderson Bros.
Hughes, W. I.		Ontario Provincial Air Service.
Humble, J. R.		Northern Aerial Minerals Exploration, Ltd.
Hutt, G. R.		Ontario Provincial Air Service.
Hutt, A. E.		Western Canada Airways, Ltd.
Hyde, J. F.		Ontario Provincial Air Service.
Ingram, H. C.		Civil Aviation Branch.
Jellison, J. E.	115 Grosvenor Ave. S., Hamilton, Ont.	
Jones-Evans, G. S.	East Kelowna, B.C.	
Kading, E. G. P.	Scapa, Alta.	
Kahre, Walter		Fairchild Aviation, Ltd., Grand'Mere, P.Q.
Kingsborough, J.	Coldwater, Ont.	
LaGrave, G. E.	1147 Bank St., Ottawa, Ont.	
Langford, D. A.	38 Lynnwood Ave., Simcoe, Ont.	
Lawson, J. M.	26 Argyle St., Simcoe, Ont.	
Leavens, A. D.		Leavens Bros. Air Service.
Lockett, Wm. G.		Fairchild Aviation, Ltd., Grand'Mere, P.Q.
Logan, R. A.	8 New Square, Lincoln Inn, London, W.C.2, England.	
Longley, E. G.		Western Canada Airways, Ltd.

AIR ENGINEERS ENGAGED IN AVIATION, 1928—*Concluded*

Name	Address	Employed by
Tall, W. S.		Western Canada Airways, Ltd.
Terry, N. C.	3125, 3rd Ave. W., Vancouver, B.C.	
Theron, J.		Compagnie Aerienne Franco Canadienne.
Thibault, E.	31, 7th St., Limoilou, P.Q.	
Thompson, E. C.	280 Bold St., Hamilton, Ont.	
Thompson, Geo. A.		Western Canada Airways, Ltd.
Thomson, N. A.	136 William St. W., Chatham, Ont.	
Thompson, W. G.		Ontario Provincial Air Service.
Tomlinson, S.		Western Canada Airways, Ltd.
Tremblay, Henry		R.C.A.F., No. 1 Depot.
Trenholme, R. G.	1012 Giles Blvd., Windsor, Ont.	
Tripp, L. J.	Shanty Bay, Ont.	
Turner, R. R.		International Airways of Canada, Ltd.
Tyrrel, J. H.		Ontario Provincial Air Service.
Vachon, Irene		Canadian Transcontinental Airways, Ltd.
Vachon, R.		" " "
Vokes, J. D.		Western Canada Airways, Ltd.
Walker, A. H.		" " "
Ware, Harry	5126 Orleans Ave., Rosemount, Montreal, P.Q.	
Warner, R. C.	108 Helena Ave., Toronto, Ont.	
Watt, Howard	112 Fairlawn Ave., Toronto, Ont.	
Wennerstrom, W.	170 Navahoe Ave., Detroit, Mich., U.S.A.	
Wenzel, C. A.		Sky View Lines, Ltd.
Wheeler, Phil.	18 Clarey St., Ottawa, Ont.	
Wight, J. R.	2169 Rose St., Regina, Sask.	
Williams, T. F.	R.R. No. 1, Woodstock, Ont.	
Wilson, A. H.	Royal Oak, Victoria, B.C.	
Winny, H. J.	Nicola, B.C.	
Woodside, Thos.		Ontario Provincial Air Service.
Wright, A. E.		Canadian Airways, Ltd.
Yorke, S. A.	9817, 90th Ave., Edmonton, Alta.	
Young, F.	403 Brandon Ave., Winnipeg, Man.	

APPENDIX "H"

STANDARD CONDITIONS FOR LIGHT AEROPLANE CLUBS AND ASSOCIATIONS

1. CONDITIONS OF GRANT

Any approved association or club applying for assistance in the formation of a light aeroplane flying organization must make the following arrangements for its efficient maintenance:—

- (a) Provide a flying field or seaplane station which fills the requirements of the Air Regulations, 1920.
- (b) Provide for the housing, repair and maintenance of all aircraft and equipment supplied by the Department of National Defence to the satisfaction of the Department.
- (c) Arrange for the services of an instructor with such qualifications and on such terms as are approved by the department and for a licensed air engineer for the maintenance in an airworthy condition of the aircraft and equipment.
- (d) Have a roll of at least thirty members who are prepared to qualify as pilots and, in addition, not less than ten further members who have qualified already and are desirous of continuing to fly.

2. ISSUE OF EQUIPMENT

(a) *Initial Equipment.*—To any approved club or association meeting these requirements, the department will issue two aeroplanes with engines complete, type to be specified by National Defence Headquarters, this equipment to be used only for the proper purposes of the club or association.

(b) *Additional Equipment.*—Should the aircraft and equipment issued under the preceding clause of this condition be insufficient to meet the demand for flying instruction in any approved club or association, the Department of National Defence may, at the request of such club or association, make a further issue annually for a period of five years to any such club or association of one aeroplane and engine complete, conditional upon the said club or association providing at the same time and at its own cost and expense aircraft and equipment of a value equal to that which it has requested the department to issue as aforesaid; the type of aircraft and equipment issuable by the department and to be provided by the club or association under this clause to be that specified by the department.

(c) *Ownership of Equipment.*—All aircraft and equipment issued by the Department of National Defence to any approved club or association shall remain the property of His Majesty the King.

3. CERTIFICATE GRANT

The Department of National Defence will grant to each approved club or association the sum of \$100 in respect of each member thereof who qualifies in such club or association *ab initio* for a Private Pilot's Certificate in accordance with the requirements of the Department of National Defence, the grant made to any club or association for such training not to exceed \$3,000 during one financial year.

4. FLYING

The enjoyment by any club or association, or by any member thereof, of any of the privileges granted by these conditions, shall in no respect relieve said club or association or any of its members from any of the provisions of the Air Regulations, 1920, and amendments thereto. No aircraft or equipment issued by the Department of National Defence shall be used in or in connection with any flight made for hire or reward, nor shall any person who is not a member of such club or association be carried in such aircraft or in any aircraft provided by such club or association under the provisions of those conditions.

In the event of any contravention of this condition or of any provision of the Air Regulations, 1920, amendments thereto, by any club or association or by any member thereof, the department may withdraw all aircraft and equipment issued by it to said club or association and suspend all flying operations of such club or association.

5. PERIODICAL INSPECTION

Periodical inspection of aircraft and equipment will be made by qualified aircraft inspectors of the Department of National Defence, without cost to the club or association.

6. GOVERNMENT RESPONSIBILITY

Neither His Majesty the King nor any of his officers, servants, agents or employees, nor any Department of the Government of Canada shall be under any responsibility or liability for or in respect of any injury, loss or damage to persons or property incurred or suffered by any approved club or association or any of its members, servants or employees or any third party in respect of or arising out of or in any way connected with or attributable to the operations of said club or association or the supply, inspection and maintenance of aircraft or equipment and whether such injury, loss or damage is caused by, arises from or is attributable to defects in aircraft or equipment issued by the said club or association with the approval of the department, or any negligence on the part of the officers, servants, or agents of the department or otherwise.

7. FLYING ACCIDENTS

A board of inquiry may be convened by the Department of National Defence to investigate any flying accident.

8. MANAGEMENT

Each club or association must be duly incorporated and must assume entire responsibility for all matters of its interior organization and management.

9. DISPOSAL OF EQUIPMENT

No aircraft or equipment furnished under any grant made may be used or disposed of except as the Department of National Defence may authorize.

10. TERMINATION OF FLYING

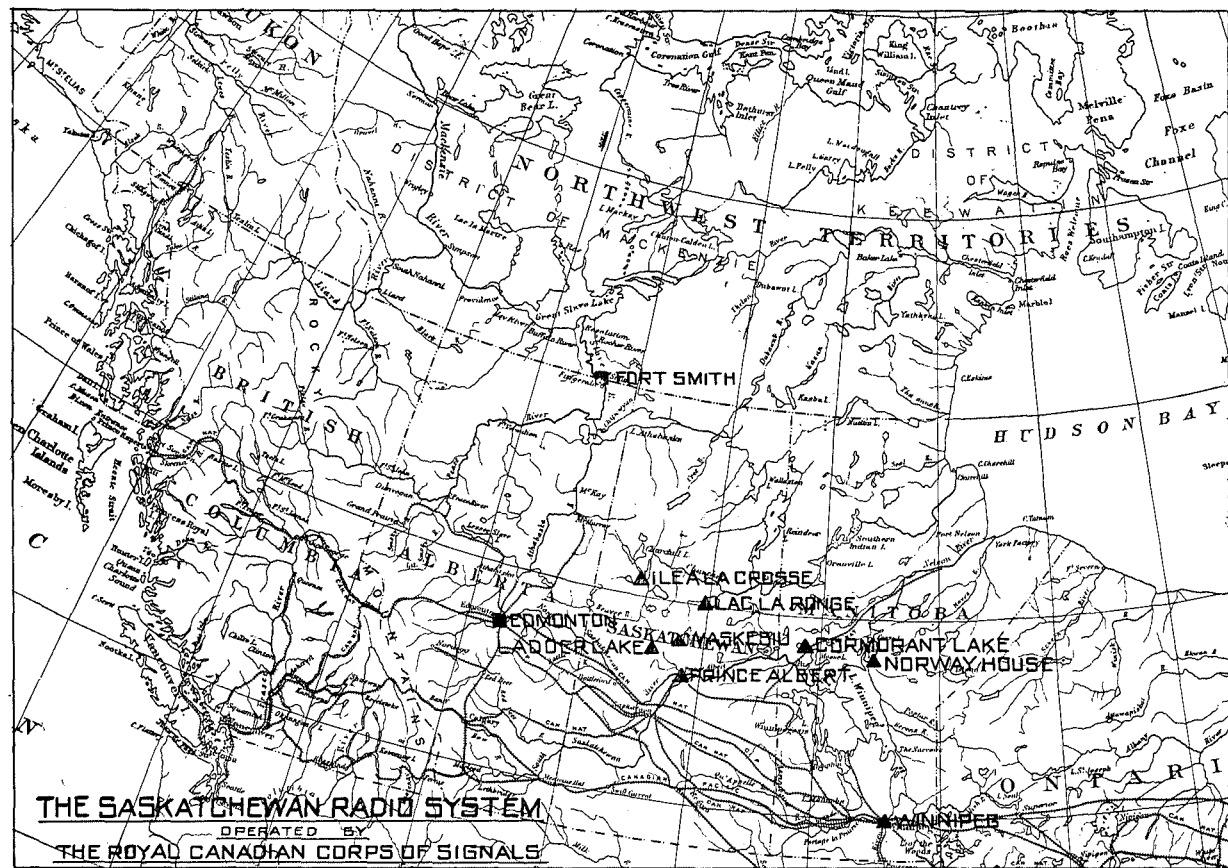
On any club or association ceasing to function, all aircraft and equipment issued by the Department of National Defence must be returned, subject only to its consumption by fair wear and tear during the operation of the club or association.

11. PERIOD OF AGREEMENT

Each agreement with any approved club or association will terminate on the expiration of five years from the 1st of April, 1928, but on the failure of any club or association to carry out any of its obligations or for any other cause (which shall not be limited by special reference to the foregoing) sufficient in the opinion of the department, the department may terminate the agreement at any time and withdraw any aircraft and equipment issued by it to such club or association.

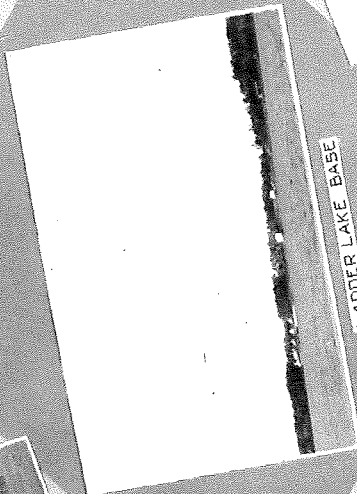
12. SECURITY BONDS

Each approved club or association must give a bond or other form of security satisfactory to the department guaranteeing that the club or association will make good at its own expense any damage or injury to the aircraft or equipment issued by the department, whether occurring through its own neglect, or default, or non-compliance with these conditions, or the Air Regulations, 1920, and amendments thereto.

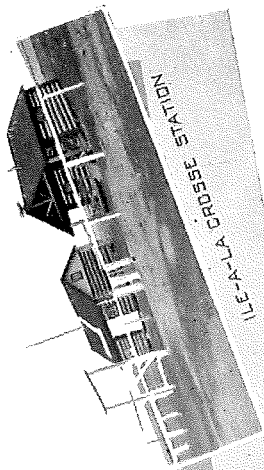




LADDER LAKE STATION

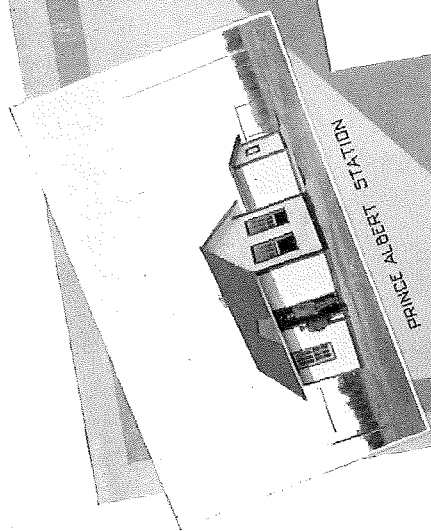


LADDER LAKE BASE

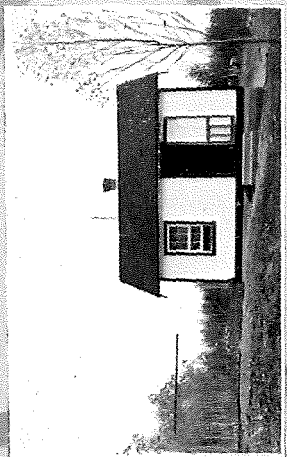


ILLINOIS ESCORT LA

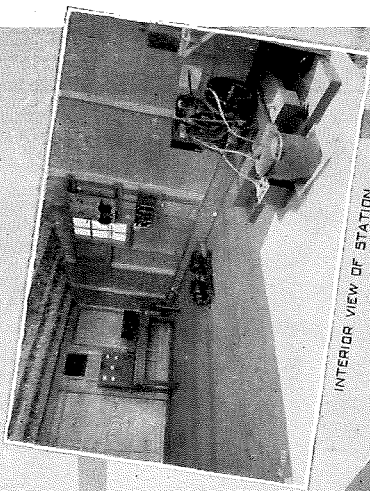
PLATE II



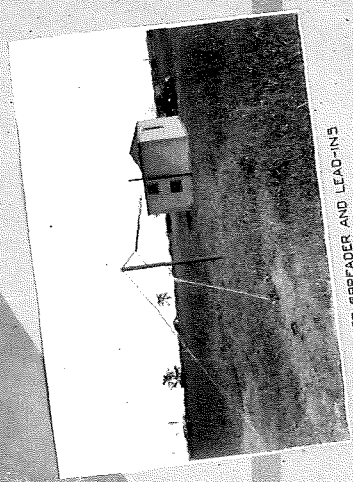
PRINCE ALBERT STATION



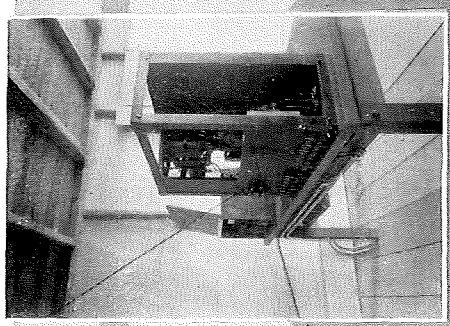
WASKESIU STATION



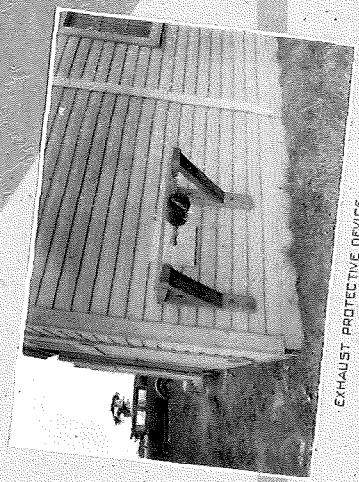
INTERIOR VIEW OF STATION



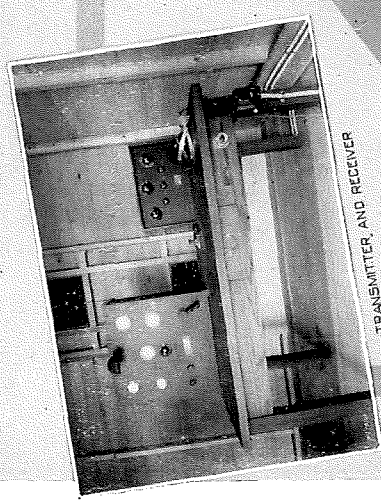
CENTER SPREADER AND LEAD-INS



REAR VIEW OF SET



EXHAUST PROTECTIVE DEVICE



TRANSMITTER AND RECEIVER

PLATE I
S.I.T.D. 100 SET

PARKS BRANCH STATION

PLATE III



PARK BRANCH HEADQUARTERS



LAKE WASKESIU



RADIO STATION SITE

